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International Edition

JULY 1988
ISSUE #334
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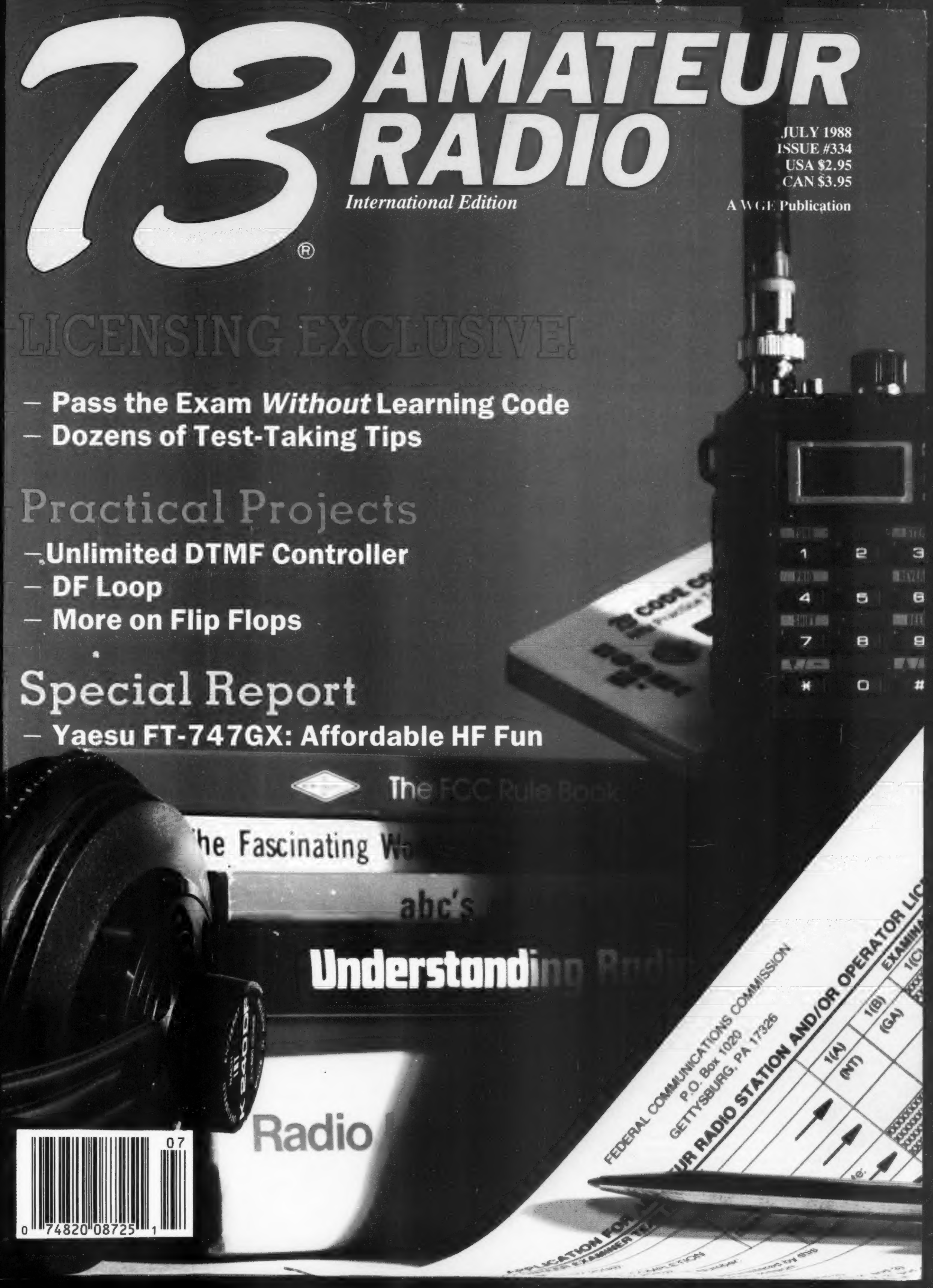
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Meet the master of 2-meter FM mobiles! ICOM's easy-to-operate IC-228A/H answers your requests for custom big rig performance and maximum frequency coverage in a compact unit designed to fit today's autos. Operate odd split and subaudible-tone accessed repeaters, monitor NOAA weather and enjoy incomparable ICOM quality with every call!

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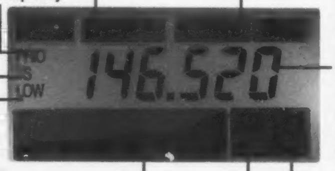

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45 OR 25 WATTS
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Each memory stores any Tx offset and subaudible tone.

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Shows signal strength when receiving, and relative output power selection when transmitting.

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  - ✓ **Eavesdrop the channel from any telephone**
  - ✓ **Use as a wire remote using ordinary dial up lines and a speaker phone as a control head.**

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POWER

The new telephone initiated control capabilities are awesome. Imagine having full use and full control of your base station radio operating straight simplex or through any repeater *from any telephone!* From your desk at the office, from a pay phone, from a hotel room, etc. You can even change the operating channel from the touchpad!

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To get the complete story on the powerful new Private Patch IV contact your dealer or CSI to receive your free four page brochure.

Private Patch IV will be your most important investment in communications.

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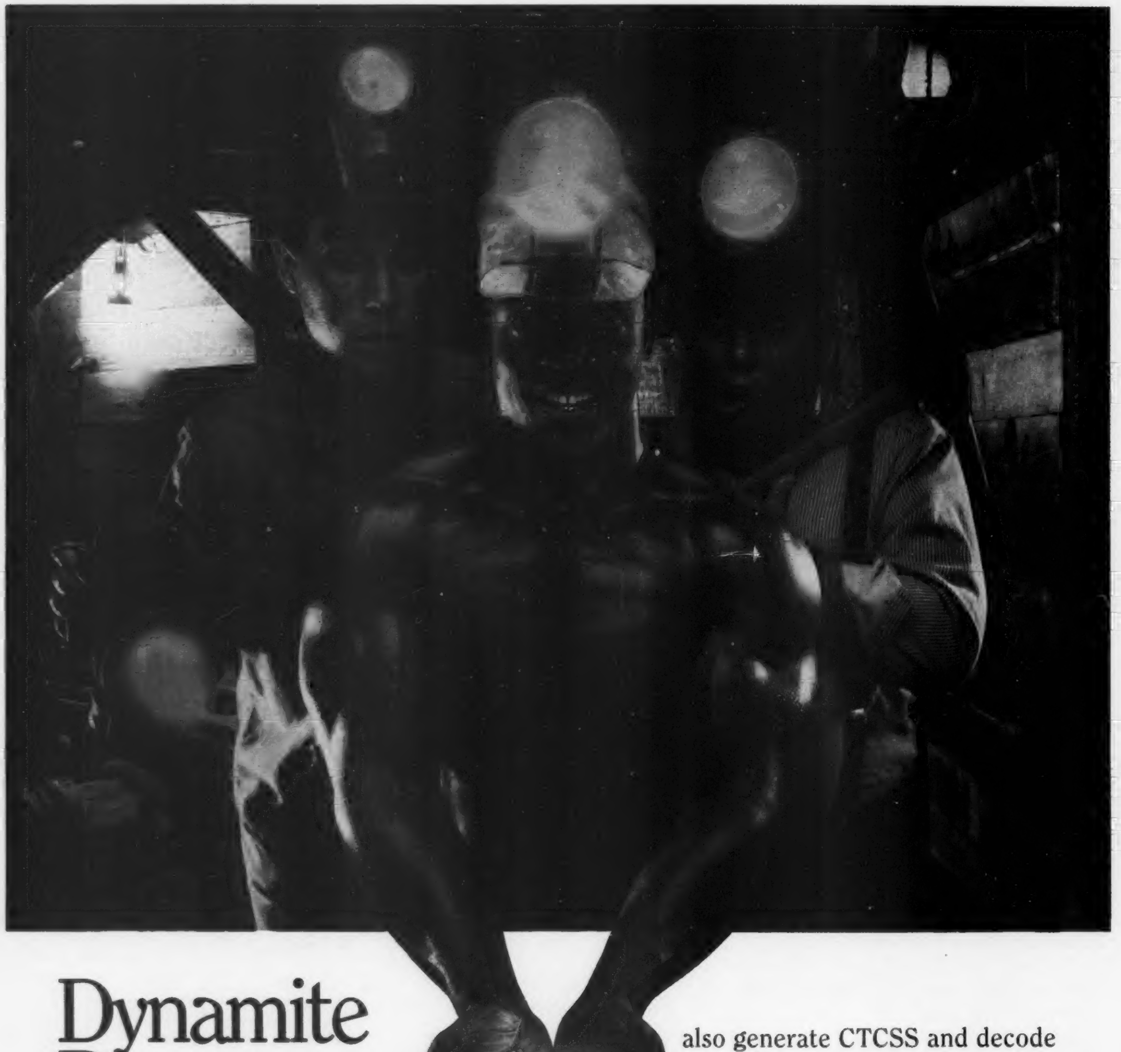

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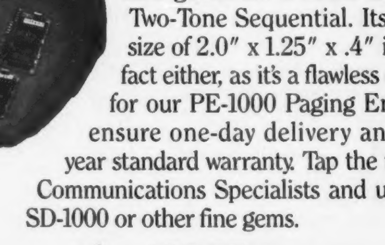

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Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

Packet

Packet gives you the fastest and most reliable error-free communications of any amateur digital mode.

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

A high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

You get both the American Western Union and the international CCITT character sets, Autostart for unattended reception and selectable "Diddle".

A receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

***A** tone Modulated CW mode turns your VHF FM rig into a CW transceiver* for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

Pictures and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

You can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

Plus . . . printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

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Welcome, Newcomers!

WHY BECOME A HAM?

For many people, the first question is: What is a ham? A "ham" (amateur radio operator), is someone who has the right to transmit on the amateur radio bands.

The public often mixes **ham radio** and CB radio. They are right in principle—both involve transmitting and receiving radio signals—but CB radio offers only a glimmer of the kaleidoscope of **radio communications** hams have at their disposal. Hams routinely talk with other hams the world over, in a variety of **modes** and on a variety of **bands**. Hams can extend the range of their signal through increased signal strength, mode choice, and through **repeaters**—even through satellites!

How To Become a Ham

Becoming an amateur, however, is just not a matter of buying the **ticket**. The aspiring ham needs to pass an examination consisting of two elements. The first is a written exam on radio theory, rules, and regulations. The other element consists of listening to and copying (writing down) Morse code. If he passes both elements, this information is submitted to the **FCC**, who sends him his license at no cost in 6 weeks' time.

How difficult is this? It's important to first set the test date to aim for. There are enough **VE** test centers that chances are very good there's an exam session on the average of once a month at a center within a hundred miles of you. Contact the American Radio Relay League in Newington, Connecticut, for a list of these test centers.

For the entry-level license—the Novice Class license—a typical applicant should begin to study daily one month before the test date. The typical applicant will in reality need only half this amount of time or less, so the extra time is insurance for confidence. The daily study routine is 45 minutes for theory, rules, and regulations and two periods of 20 minutes each to copy code.

Morse Code

Aspirants seem to have the most trouble learning the code. Many have a hard time committing themselves to learning it because they don't see the sense in learning a mode which conveys information so slowly, and which many people condemn as archaic in the face of newer, more sophisticated, modes. There's even a lot of talk about creating a no-code license amateur license in the US, and Canada is taking steps toward a no-code license, scheduled to take effect next year.

On the other hand, Morse code remains the best combination of simplicity of production and transmission, and effectiveness in conveying information during poor **propagation**. (See *Welcome, Newcomers* in the April 1987 issue for details.)

Your feelings about the code, however, don't change the fact that it's still an exam requirement. If you're anti-code but want your ham license (and don't want to wait for the requirements to change)—compartmentalize your feelings. Concentrate on learning it for the exam, and *then*, if you still feel strongly against it, join the campaign for a no-code license.

Code learning and copying, like many rote exercises, can quickly fatigue you at first. Our minds have a way of rebelling against learning something that doesn't give us the stimulation of reasoning. Many perfectly capable people have themselves convinced that they are unable to learn the code. Their mistake is that they confuse mental *incapability* with mental *blocks*.

How do you deal with this? By learning in frequent but *small* doses. I am not an ardent fan of code, but I learned it best when I ended my practice sessions early, often times before I even felt like it. This kept my mind open for the next session.

This month's July issue has a number of articles packed with pointers on how to learn the code. There's an excellent article for Novice aspirants who clutch under the "real-time" demand of copying code as it's sent—it teaches you how to copy the tones, which you can decipher at your own pace after the sending session!

See you on the bands come September!

...de KA1HY

GLOSSARY

Ham Radio—There are many explanations of the origin of "Ham" Radio. One theory holds that, in the days of the peak use of telegraphy, a "ham" referred to a poor operator, which radio operators humorously adopted! Another explanation holds that it's just an abbreviation of "amateur."

Radio communication—Radio is used here in its broader meaning. A radio wave is an electromagnetic wave that travels through a medium, such as air. They are described in terms of either **frequency**—the number of cycles of that wave that pass a fixed point in a given amount of time, or **wavelength**—the distance from one peak to the next peak of that wave. An RF (radio-frequency) wave has a wavelength range of 30 kilometers to 1 millimeter, which corresponds to a frequency range of 10,000–3 million million **Hertz** (cycles per second).

Radio communications refers to any sort of information that's conveyed on RF waves. Hams are allowed to encode RF waves in many forms, including voice, radioteletype, and video.

Mode—This describes both the kind of information encoded on a radio wave *and* the modulation method used. For example, stations on the AM broadcast band are both voice mode (the kind of information) and Amplitude Modulated (AM) mode (modulation method). Stations on the FM broadcast band are also voice mode, but thier modulation mode is Frequency Modulation (FM).

Band—A segment of the Radio Frequency spectrum.

Repeater—An unmanned transmit/receive site that receives an FM signal and simultaneously retransmits it on another frequency. This increases the range of a signal.

Ticket—Ham jargon for the license to transmit on the amateur bands.

FCC—Federal Communications Commission. The US government agency responsible for the allocations of frequencies for radiocommunications and broadcasting in the US.

VE—Volunteer Examiner. This is a ham who holds an Advanced Class or Extra Class license who has been accepted by a Volunteer Examination Coordination body to administer exam sessions. Until recently, the FCC directly administered amateur exams.

Propagation—Refers to the conveyance of an electro-magnetic wave through a medium, such as the atmosphere. The better the propagation, the further the wave travels.

QRM

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Contractual Agreement: Just your breath—did you use Scope today?—on this magazine enters your body and soul into contract with the Spirit of Amateur Radio. Hereafter you will promote this hobby with the fervor of a religious zealot. You will recruit no fewer than ten new hams in the next six months, you will carry out at least one public service act within the next year, and you will solder something once each week for the rest of your life. Above all, you must regularly report your progress to the editors of this magazine through feedback cards, letters, or electronic means. We'll be watching you!

73 AMATEUR RADIO®

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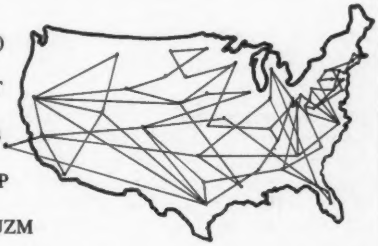

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It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 89. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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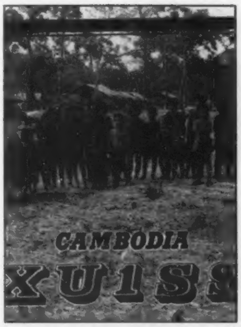

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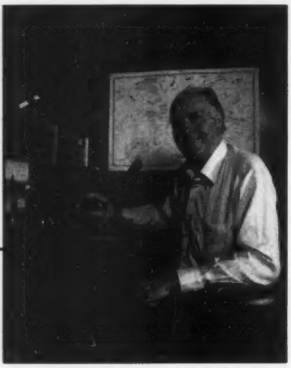
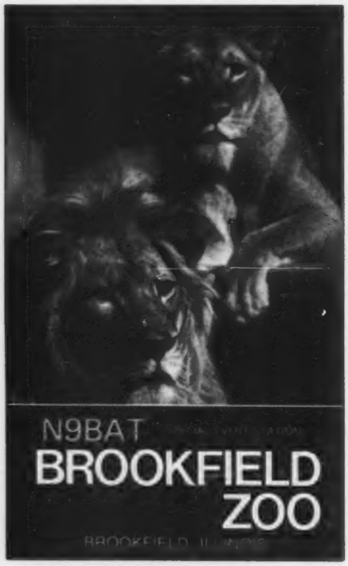


Why Posthumous Awards?

Bill Bennett W7PHO, a DX legend, died recently. Something about the move to honor him at the Dayton Hamvention just didn't set right with me. There wasn't anything wrong with honoring the years of service Bill gave to our hobby. Yet something bothered me.

As usual, my thinking came together when I was taking a shower. I suddenly knew what was wrong. Why in the devil are we going to honor Bill after he's dead? That's crazy! It isn't like we didn't have quite a few years to think of this while he was alive and tell him how we felt. Then he could have known of our appreciation for all his work and gotten some satisfaction out of it. These posthumous honors are for the birds.



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

This came home to me even more a few days ago when Bill Hoisington K1CLL died. Bill wrote dozens of articles on simple-to-construct ham equipment. He was an absolute wizard at knocking together gear for any band right on up through 3,000 MHz on his kitchen table, using nothing more than a couple of low cost transistors. His rigs would light a light bulb, even at those frequencies.

I first ran into Bill K1CLL when he was operating on 2m from a fire tower on a Rye, New York, mountain. He was W2BAV then. His W2BAV VHF antennas were state of the art. Indeed, I used one of his 16-element beams when I operated from the top of the News Building on 42nd Street in Manhattan. I used to talk with Bill frequently as we vied for DX contacts on 2m. That was back in 1948, forty years ago.

When Bill got to be around 62 years old, over twenty years ago, my understanding is that he was suddenly fired from his electronic technician job by his employer so they wouldn't have to pension him at 65. Diamond Tool and Horseshoe Company, as I recall. Bill got in touch with me and proposed a series of articles on home construction for *73*. Fine with me.

So Bill moved to Peterborough and bought a farm so he could be near *73*. He produced endless articles that thousands of readers enjoyed and built. He designed simple receivers, transmitters, amplifiers, test equipment and so on.

He was fortunate enough to get divorced from a rather nasty second wife. The next thing I knew he went to the Philippines to marry a woman who wanted to move to the US. He brought her back, got divorced, and wrote more articles.

Then he developed cancer. The doctors told him nothing could be done—hopeless. So he went back to the Philippines to see a psychic healer, threw off the cancer and married a lovely Philippine woman, Pilar. I heard off and on from him from Manila, where he was living happily.

Six years ago, when I visited Manila, I tried to find him. The local hams said he'd gone back to the States. Sure enough, he turned up in Peterborough a year later. Moved here with Pilar. He had been recently working with the *73* editors on a new series of simple construction projects. He was a genius at that, always able to use easy-to-get parts that he'd put together in a novel way. Ham radio suffered a great loss when Bill died of a heart attack a few days ago.

Too Late for Thanks

I wonder how many readers who enjoyed Bill's articles ever wrote to thank him?

So I got to thinking about W7PHO, who should have been honored while he could have enjoyed it. And K1CLL, too. And then I began to think of all the other outstanding hams we've ignored while they were alive.

The father of RTTY was John Williams W2BFD, a particular friend of mine. I doubt if we ever would have had RTTY without John. He did the early hard work of locating Teletype machines and getting them released for ham

Continued on page 46

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144.0 144.1 144.5 145.8 146.0 148.0 MHz

CW | USB | FM | USB | FM

- Optional front panel-selectable 38-tone CTCSS encoder
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- High performance receiver with GaAs FET front end
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PROJECT

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- MC-48 16-key DTMF hand microphone and microphone hook included
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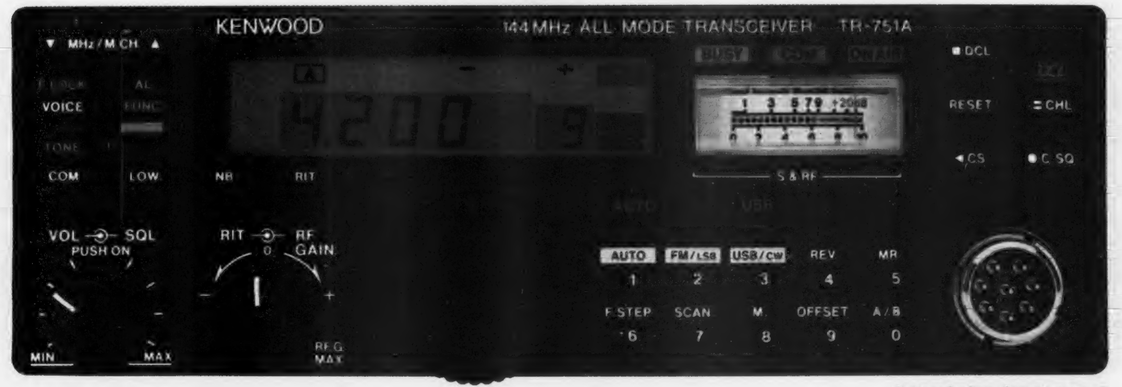
Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2 m antenna tuner
- **SWT-2** 70 cm antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50B** mobile speakers
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-43S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.
- **MA-4000** dual band antenna with duplexer



Actual size front panel

TR-851A

70 cm SSB/CW/FM transceiver

The same winning features are yours on 70 cm with the TR-851A!

- Covers 430-439.999 MHz
- 25 W high power/5 W adjustable low
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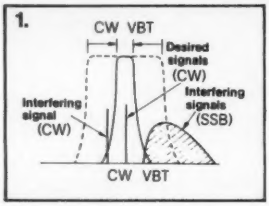
TS-940S

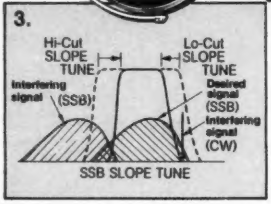
Competition class HF transceiver

TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

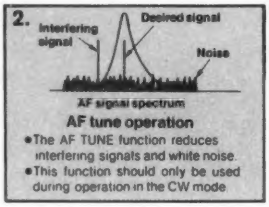
- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***



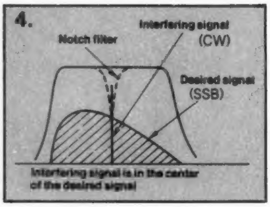
1.
CW VBT
Desired signals (CW)
Interfering signal (CW)
Interfering signals (SSB)
CW VBT



3.
Hi-Cut SLOPE TUNE
Lo-Cut SLOPE TUNE
Interfering signal (SSB)
Desired signal (SSB)
Interfering signal (CW)
SSB SLOPE TUNE



2.
Interfering signal
Desired signal
Noise
AF signal spectrum
AF tune operation
•The AF TUNE function reduces interfering signals and white noise.
•This function should only be used during operation in the CW mode.



4.
Notch filter
Interfering signal (CW)
Desired signal (SSB)
Interfering signal is in the center of the desired signal

1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

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Number 3 on your Feedback card

QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Phase 3C

At press time, **Arianespace**, the European Space Agency, announced that the launch of AMSAT Phase 3C was set for June 8th. The P3-C satellite has three transponders on board as well as the RUDAK digital packet communications experiment. AMSAT-NA advises the following revised Phase 3-C operating frequencies.

Mode "B" (50 Watts PEP)
Input (Uplink): 435.420–435.570 MHz
Output (Downlink): 145.825–145.975 MHz
General Beacon: 145.812 MHz (CW/RTTY)
Engineering Beacon: 145.985 MHz

Mode "L" (Primary Transponder)
Input (Uplink): 1269.62–1269.33 MHz
Output (Downlink): 435.715–436.005 MHz
General Beacon: 435.651 MHz (PSK/CW/RTTY)

Mode "JL" (Secondary Transponder)
Input (Uplink): 144.425–144.475 MHz (50 kHz)
Output (Downlink): 435.990–435.940 MHz

Mode "S"
Input (Uplink): 435.601–435.637 MHz
Output (Downlink): 2400.711–2400.747 MHz
General Beacon: 2400.325 MHz

RUDAK is a world-wide independent packet data channel using separate receive and transmit frequencies. (Mode "L" 50W PEP)
Input (Uplink): 1269.70 MHz (2400 bits/second DPSK)
Output (Downlink): 435.677 MHz (400 bits/second PSK)
The RUDAK packet message project is the brainchild of Hanspeter Kuhlen DK1YQ.

JARL

The Japanese Amateur Radio League has released a reevaluated band plan for the spectrum from 50 MHz to 10.4 GHz. It matches much more closely than their previous plan the bandplans stipulated for the three IARU Regions. Another key point is that data and image communications will each have two exclusive mode segments: SSB and FM.

Canada Packet

The Canadian Department of Communications encourages packet radio operation in that country. The DOC informed the CRRL that it has no objection to amateurs holding an Advanced Amateur certificate, or a certificate with a six-month endorsement, operating packet radio on frequencies recommended by the ARRL Ad-Hoc committee on amateur radio digital communications. No amateur radio group, including the CRRL, solicited this statement. It's a natural step, since the DOC has routinely given individual amateurs special authorization to operate on these frequencies.

Broadcasting OK

The FCC won't limit the broadcast time of an amateur station issuing bona-fide news bulletins, as long as these narrowcasts or QSTs are directed only at the amateur community. The Commission states this in its decision to turn down a rule-making proposal filed by James Fisher K4GF of Ocala, FL. James K4GF proposed to limit amateur broadcasting—"bulletin mode"—to ten minutes per day. The FCC's reasons for refusing the proposal:

- There is no proof that the broadcasts cause sufficient congestion on the ham bands.

- Bulletin's serve the amateur community by providing an effective means of keeping hams informed about their service.

Amateur broadcasts were officially sanctioned 40 years ago, as the result of the 1948 Docket #8918, which led to the establishment of rules that permit hams to issue one-way transmissions.

W7PHO Honor

Bill Bennett W7PHO is the first ham to posthumously receive the Dayton Amateur Radio Association "Radio Amateur of the Year" award. Bill is honored for his years of dedication to Amateur radio, especially DXing.

Bill's most notable achievements are the creation of the Western Washington DX Club, and the DX Family Hour Net. He also worked closely with the ARRL to establish their outgoing DX QSL Bureau. Bill W7PHO died at age 78 on December 23rd in Seattle.

900 MHz

The FCC authorized the Association of American Railroads to use six conventional 900 MHz frequency pairs for an "Advanced Train Control System." These are located in the 896–901 and 935–940 MHz bands. Although this system will mainly be used for digital information on the position, speed, and other vital statistics of the train, it will also have voice capability.

This a good opportunity for equipment manufacturers to target two markets at once. They could produce radios that will easily modify to amateur use on the 33cm band.

70cm Infringement

Northern Hydraulics, Inc., a mail-order business in Burnsville, Minnesota, is marketing an Amateur HT to use as a no-license CB radio. The "Eagle" HT operates on the 440–449 MHz band. In their Sale Catalog #46, they suggest using this HT for business purposes: "A real time and work saver for surveying, construction, highway, and field work coordinating." They do state that the unit is FCC Approved, but don't state that any sort of license is needed to operate the unit.

Many hams have called their toll-free number (800-533-5545) to inform them that their presentation of this radio promotes illegal use. The company has so far ignored complaints.

Send'em In!

***QRX* readers may have noticed the paucity of photos** in this column recently. It's very simple—we can't print what we don't have to print!

We will review any graphics related to Amateur radio, however remotely. High-contrast color photos are preferred. Send in your photos for the ham community to see!

Articles!

What's happening on 33cm? Why does over 20 MHz of this band lay fallow? Think of the possibilities, especially for high speed data transfer, on this little-used stretch of spectrum! *73 Magazine* is especially interested in promoting use of the 33cm (902–928 MHz) band, and intends to run a theme issue on what's happening on that band in the not-too-distant future. We are looking for articles, reveiws, and other text items.

Let's make 19.2 KB and above digital communications a reality for many more hams!

Reprints

If you are interested in obtaining article reprints from *73*, call or write Linda Reneau at *73* Editorial, (603) 525-4201, Ex. 551. Reprints are $3 for the first reprint and $1.50 for each additional. Pay with cash, credit card, or check.

That's All, Folks

Thanks for this month's QRX items go to: *Westlink*, *W5YI Report*, AMSAT, and *CAREN's World.* Keep your photos and news items rolling in to: *73 Magazine, 70 Rte. 202N, Peterborough, NH 03458-1194. Attn: QRX*

Number 4 on your Feedback card

Code Test Sure Shot

Legally pass without learning Morse Code!

by C. Harold Love KA0NTK (SK)

It's possible to pass the Novice code exam if the examinee knows it at much less than 5 words per minute. It's possible to legally pass even without knowing the entire Morse code, or even most of it. This article tells how. The techniques described here may also be useful for those who are taking the test and have actually learned the code, since they will virtually ensure success on the code exam.

In The Middle

I approach this topic with some trepidation, since I am sure that I will anger a number of people by showing how to pass the exam without learning the code. On the other hand, for those in favor of a no-code license, this article will probably not go far enough, since it still requires sitting down and taking the exam. Those in favor of the code exam should console themselves. This technique will *not work* for passing the 13 or 20 wpm exams.

Those in favor of no code test at all: You can learn everything you need to know to pass the 5 wpm code test in a couple of hours!

Test Format

In order to understand how it's possible to pass the test without learning the code, the aspirant must first understand the nature of the Novice code test. It consists generally of ten fill-in-the-blank questions about the content of five minutes of QSO-type code transmission. Five minutes at five words per minute is the equivalent of only 25 five-letter words. If all of the characters transmitted were letters, that would be 125 letters. But numbers, punctuation, and prosigns count as two letters, so the actual number of characters transmitted in a Novice code test is really around 110. With this small number of elements, the examiner doesn't have much choice about what kinds of questions to make up, so they are relatively easy to anticipate.

The text itself is in a conversation (QSO) format. Therefore, the first characters sent make up the station callsigns of the stations involved—"(His call) DE (Your call)." These are repeated at the sign-off, the end of the transmission. The test-taker can also count on hearing the Readability/Strength/Tone (RST) signal report, and most likely the operator's name.

The FCC insists that every letter, number, and punctuation mark be included in every test. The Volunteer Examination Coordinators (VECs) have so far unsuccessfully tried to talk the FCC out of this. The FCC likely wants to prevent the make-up of a really easy test that doesn't include the harder letters and punctuation marks. Actually, the all-character inclusion works in favor of the test taker because it makes it easier to predict what will be on the exam.

> ***"You can learn everything you need to know to pass the 5 wpm code test in a couple of hours!"***

How are all of the ten numbers used? The callsigns account for three of the numbers (because one of the callsigns will undoubtedly be portable in another call district, since this is about the only way to work in the required "/" sign), and the signal report accounts for another three (the last of which will almost certainly be a 9). The four remaining numbers will likely be used for the operator's age, temperature, transmitter power in watts, and the number of years the operator has been licensed. Since there is so little information in a five word-per-minute test (because it is so brief), if these items are included in the code transmission, they will have to be included in the fill-in-the-blank questions.

- Callsigns of the two stations
- RST Report
- At least one of the operator's names
- Two of three of the following: age, temperature, power, and years licensed.

Right away it's possible to predict at least six of the ten questions on the exam. Seven correct or better gives a passing grade.

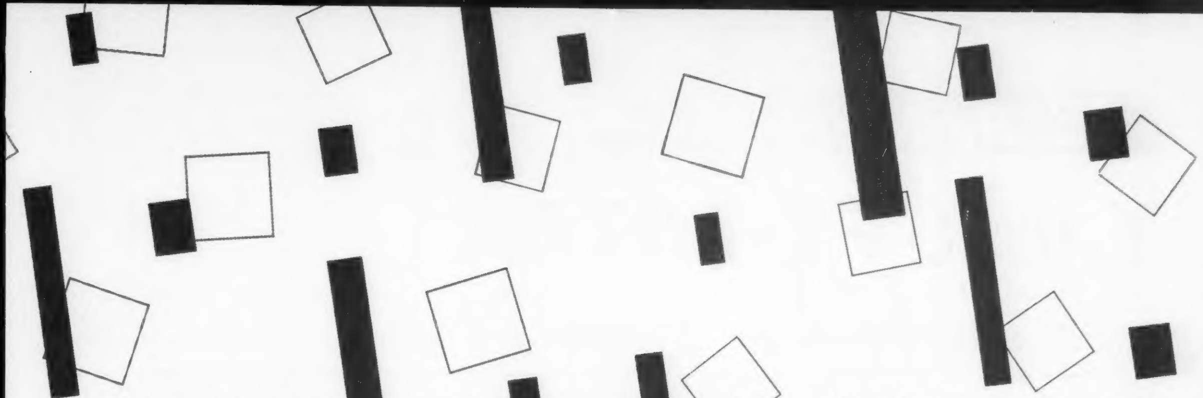
Make A Grid

Bear in mind that most examiners allow test takers time after the code transmission to fill in any blanks and get their test paper into shape. The time limit applies only to the five minutes of the code transmittion, not answering the 10 questions.

The trick, then, is to not copy the characters represented by the dits and dahs (dots and dashes), but the dits and dahs *themselves*!

First, before the test starts, draw a grid on the copy paper made up of seven vertical and thirteen horizontal lines. It's easiest to do this with a full-sized (8 ½ x 11 inch) sheet of unlined paper. This gives fourteen rows of eight squares, or 112 squares altogether.

Each time a character is transmitted during the test, write down in each grid square the dits and dahs exactly as heard. It's possible to separate characters, because they have longer spaces between them than the spaces between dits and dahs within a character. Make a short vertical stroke for a dit and a longer vertical stroke for a dah. It's much faster to draw a vertical than a horizontal stroke. Put one character in each of the boxes. If the test code transmission uses the Farnsworth system, in which the letters are transmitted at high speed with long spaces between them, the easiest way to record them is to wait until each character is sent and then make the marks. If the code is sent at a straight 5 wpm spacing, it will be easier to write each dit and dah as it is sent. Don't convert the characters into letters and numbers even if you know which ones they are, because this will slow you down—*write down exactly what you hear*.



It will also be useful, though not nece y, to make a heavier or longer mark for er spaces that seem to indicate the end of w s.

At the end of the exam, write the entire alphabet and set of numbers (1–0) down on another sheet of paper. The test taker does need to know some of the simpler letters. In working with someone who knew absolutely no code, I found I could easily teach him the following letters in about 1 hour: E, I, S, H, T, M, O, A, W, J, N, D, B, and R.

E is the most common letter in text, and it has the simplest Morse code symbol—one dit. The first four letters of this group can be classified as being similar to e—that is, they are "e-ish." Using the mnemonic "e-ish" recalls the first four letters. E is one dit, I is two, S is three, and H is four. The next three letters T, M, and O, are composed solely of dahs, so they take more oomph to write (get it. . . Take More Oomph). T is one dah, M is two, and O is three.

Just use these two simple mnemonics and translate the short and long strokes at (relative) leisure after the code test transmission.

The only characters left to learn are numbers—which takes about 30 seconds. All are five tones long, in a combination of dits and dahs. They follow a distinct pattern. The number one is a dit followed by four dahs. The number two is two dits followed by three dahs. This pattern continues to five, which is five dits. Six is a dah followed by four dits, seven is two dahs followed by three dits. This pattern continues to 10, which is five dahs.

Like Puzzles?

Remember, it's not necessary to know these letters and numbers fast—just be able to recognize them on the grid system.

The next step is to write down the symbols for all the known letters and numbers on the alphabet list. Now go back to the test paper and fill in all of the Morse code characters that you can. Try to see the exam like a cryptogram, solving for the unknown items.

First (after the repeated Vs that start the test), the transmission will begin with callsigns, since it is a QSO-type test. Every test that I've seen so far only uses US callsigns, and they must begin with N, W, A, or K. All but one—K—are on the above list to memorize. The two callsigns will be separated by the word "DE," composed of two of the memorized letters, so the first letter after "DE" must, again, be N, W, A, or K. If a callsign e in a number d one of them probably w), then the sy ol before the number is a slant bar.

The single most importan rd in the text is the word "is." This is bec e it is almost always the case that the word er "is" will be the answer to one of the n questions. Thus, the following copy, "A__E IS 26," is easily deciphered as the operator's age. The missing letter is "G."

> ***". . . most examiners allow test takers time after the code transmission to fill in any blanks and get their test paper into shape."***

Similarly, "TRANSMITTER IS __ENWOOD," answers the question about the rig brand. It helps to be familiar with the names of major Amateur transceiver companies: ICOM, Kenwood, Yaesu, Heathkit, Ten-Tec, Drake. R__NNIN__ 200 WATTS gives info on how much power the transmitter is running, and deciphering the rest of the message teaches the symbols U and G. There are a number of other possibilities.

The next step is to take the letters you don't know but have been able to decipher and add them to the alphabet list, then carefully fill them in wherever else they appear in the text. Finally, it may be possible to fill in yet more of them because in the Novice test there are so few characters. If all numbers, punctuation, and prosigns count as double, and they all must be included, then the maximum number of characters that can be transmitted in five minutes is 109. There are 42 different numbers, letters, punctuation marks, and prosigns. Thus, only 69 of the characters can be duplicates, and most of those duplicates will be vowels, since all words contain vowels. Furthermore, since the callsigns are repeated at the end of the transmission, this cuts out about 10 more characters as duplicates. Thus, it is highly unlikely that rare letters, such as Z, Q, and X will be repeated, unless in the callsigns. The process of elimination can determine a few more letters.

Now see how many questions you can answer. With luck, one of the callsigns will contain only memorized or deciphered letters, but don't count on this. Thus, be prepared to answer seven of the remaining eight questions correctly. One of the questions will probably be the name of one of the two operators. Two general rules will help with this. First, with the copy, NAME IS BI____, it's a sure thing the name is Bill, *and* that Bill is the name of the operator doing the transmitting since no one says in a QSO, "YOUR NAME IS BILL." Secondly, if there are clearly two names in the text, it's a reasonably sure bet that the first one is the name of the operator being transmitted to, and the second is the name of the operator doing the transmitting. In QSOs, almost everyone says the other person's name first.

Another piece of information that may appear is the operator's license class. Look for words like NO__I__E, __ENERA__ or E__TRA that may be the answer to that question.

Final Words

Is it possible to pass the exam without actually learning the Morse code? In nine out of ten cases, yes. It's hard to imagine that it would take more than two tries using this technique, and again, this is a technique that can easily be learned in an hour or two.

One word of warning: This method doesn't prepare an operator to actually have CW QSOs. Real QSOs demand "real-time" knowledge of the code. I suggest learning the code in earnest, because not only is Morse code fun (once you get your speed up to 15 words per minute or so), but it provides an opportunity to work DX stations not available on the phone bands. Also, since CW equipment is relatively easy to build, it gives an opportunity to experience the thrill of talking to people halfway around the world using a transmitter that the operator built himself.

No more excuses. Don't tell yourself you can't learn enough code in an afternoon to get a Novice or Technician license. And it's all legal!

Unfortunately, Mr. Love passed away earlier this year. This technique undoubtedly will generate quite a few bouquets and brickbats. Please forward your comments to 73 editorial offices rather than deluging Mr. Love's family with mail.—Ed.

Number 5 on your Feedback card

73 Review

by Bill Clarke WA4BLC

Yaesu FT-747GX

An affordable transceiver for Novice and *Extra*

Yaesu USA
17210 Edwards Road
Cerritos, CA 90701
List Price: $889.95

For several years each new transceiver brought to the market has been more complex, offered more features, and looked more formidable than its predecessors. Of course prices rose with each new entry, with top of the line radios going out of sight.

If the dollars involved are not enough of a problem, there is no modern transceiver built for the fellow looking to replace a trusty old Drake or Heathkit tube radio. No affordable, basic, recently-built radio meets the needs of arm chair ragchewing, light contesting, or enjoyable DXing...until now.

Well, Yaesu has made a stab at solving these problems by introducing a new straight forward transceiver that is full featured, excellent quality, and simple to operate. They call their new radio the FT-747GX.

First Impressions

The FT-747GX gives a lasting first impression when seen for the first time. It only weighs 7.25 pounds. The radio is very simply laid out, with only 20 controls, 15 of which are push-operated switches. The central digital display has black characters and symbols on an amber background showing frequency, mode, memory, VFO, filter selection, and more.

The FT-747GX looks so simple to operate I hooked it up and turned it on without referring to the operating manual. There were no surprises or problems encountered, and operation commenced immediately.

I should note, however, that I later read the entire manual. It is very complete, loaded with accurate information, no grammatical errors, and is easily understood. The manual also contains numerous hints to aid the operator in enjoying the radio in particular and the hobby in general.

The 747's buttons and controls all operate very smoothly. The main tuning knob has indents, and does not free-wheel like most tuning knobs. I found this a little disconcerting at first, but I quickly became used to it.

Receiver

The LCD digital display is easily read, and its amber color is easier on the eyes than some red or green LED displays seen on other radios. The frequency is displayed in large numbers, while other information (VFO in use, memory number, mode, scan, etc.) is shown in smaller characters and icons.

The SSB tuning rate is 25 Hz per click of the main tuning knob. The frequency ratio of turns is about one turn to 1.3 kHz. Fast tune is 2.5 kHz per click and is push switch selectable. The normal AM tuning rate is 1 kHz per click, 10 kHz at the fast rate.

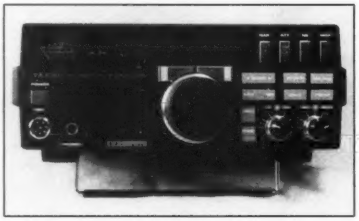


Photo A. Front of the FT-747GX.

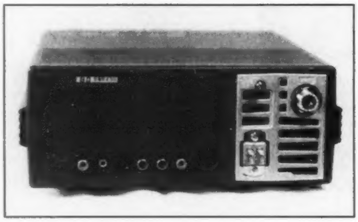


Photo B. The rear panel showing the part of the cast aluminum transmitter chassis.

The 747 has all the necessary filters built in, including a 500 Hz narrow CW filter and 6 kHz AM filter.

The memory scheme used on the 747 is very straightforward, not requiring mental gymnastics to use. Just dial the frequency and push a button. There are twenty memories.

To determine the reproduction quality of a new rig I always tune it to the local country western station on AM and listen in. The 747's audio quality was excellent. In fact, it compared very favorably with my large station speaker. The front-facing speaker has outstanding audio reproduction. There is no need for an external speaker.

The receiver is very quiet, although not as quiet as a Ten-Tec Corsair. There is no RF GAIN control, but a 20 dB attenuator is available at the push of a switch. The 747 has a noise blanker that does very well against the woodpecker and simulated ignition noise, too.

The squelch is active in all modes, and is utilized during scanning. Memory scanning is controlled from the mike.

Transmitter

Audio reports during SSB operation were all good, with most indicating excellent quality voice transmission. All contacts were made using the standard microphone that is supplied with the radio. Just remember, audio reports are not scientific and vary with the receiving operator's hearing and preferences.

Semi break-in keying is a feature of the 747. The CW note received good reports and looked good on the scope.

The FT-747GX, like most current transceivers, has two VFOs allowing it to work SSB/CW splits and split band operation. Internal programming of the CPU prevents general coverage transmitter operation.

Inside The 747

Tools are not needed to get inside the 747. Just release a couple of locks, push on the designated pressure points, and the plastic case slides off the chassis. The case is completely shielded by a metal coating on the inside.

It's interesting to note that several operator changes can be made to this radio without opening it. These include side-tone volume, memory backup enable, and carrier adjustments.

The most impressive feature of the inside of the 747 is the large cast aluminum transmitter housing that provides the necessary heat sinking for the finals. It is cooled by an internal fan.

Bench Testing

To prove the manufacturer's claimed specifications, I bench tested the 747. No problems were encountered and the little radio did everything the manufacturer said it would.

The following equipment was used during the bench check:

- Leader LDC 8243 Frequency Counter
- Marconi Instruments 2022 Signal Generator
- Hewlett Packard 606 HF Signal Generator
- Hewlett Packard 651A Audio Generator
- Bird 43 Wattmeter
- Hewlett Packard 8551B/851B Spectrum Analyzer
- Cushman CE-5 Monitor
- Tektronics 475 Oscilloscope

Although the specifications check out in a laboratory environment (see sidebar), the performance of most currently available amateur transceivers exceeds the capabilities of the human ear, propagation, and atmospheric conditions. For example, high sensitivity does little good on 75 meters at 7 PM when all the kilowatts are on.

One interesting test I made was to key down the transmitter at full power for thirty minutes. No overheating was noted. The large chunk of aluminum does its job very well.

Operator Comments

The very slow main tuning rate is nice. I like it better than the 10 or more kHz rates found with the competition. However, fast tuning causes the unit to stop only at 2.5kHz intervals. It won't do very well for a fast check of a band. It is only meant to get the operator from one place to another quickly.

The standard microphone has UP/DOWN and FAST buttons for armchair tuning.

The 747 is ready for RTTY, Packet, and AMTOR operation. However, I think that the market this radio is directed towards will find more use for the SSB and CW capabilities. The FM unit is optional.

The mode is not selected by the rig; the operator must select it. I thought this was a drawback that should have been addressed when the radio was designed, but others may not find automatic upper or lower sideband selection a problem.

There is a built-in surge protector and antenna line fuse to protect the receiver from static discharges. Other manufacturers should take notice of this.

There is no IF shift or PBT (pass-band tuning). One or the other should have been built in.

The push switches are well labeled and easy to operate.

The switch labeled CLAR is the receiver clarifier. The terminology is out of place in ham radio. Think of it as RIT (receiver incremental tuning).

The cooling fan is very quiet.

The 747 has no notch filter, but most of those type are difficult to control. I recommend an outboard automatic notch filter such as the Datong ANF (a favorite add-on).

The 747 is CAT ready and may be controlled by a computer. It also means the Stone Mountain Engineering QSYer keypad will operate with it (another of my favorite add-ons).

Wrap-up

I feel the 747 is an excellent entry level rig for new hams. However, more importantly, the 747 fills the gap between yesterday's tube radios and the expensive and complicated rigs of today. Any operator will feel at home with it, and will not be overwhelmed by complexities. There are less controls on this little radio than on most older tube radios and operation is very straightforward. No operator intimidation here!

Would I recommend the FT-747GX? Yes! It has all the necessary features of the expensive radios to make it a very capable transceiver, yet the price is remarkably low. Don't be fooled by the low price and light-weight plastic case. The 747 is a piece of merchandise with excellent quality.

Thank you to the folks at the Electronic Equipment Bank of Vienna, Virginia, for the loan of a new Yaesu FT-747GX, and the use of their very complete test bench.

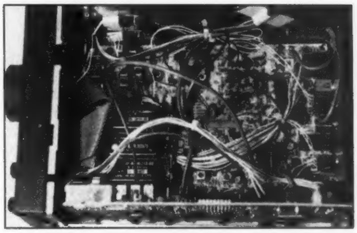


Photo C. Notice the factory installed (standard) crystal filters.

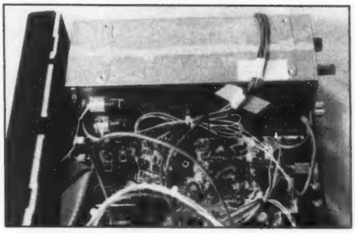
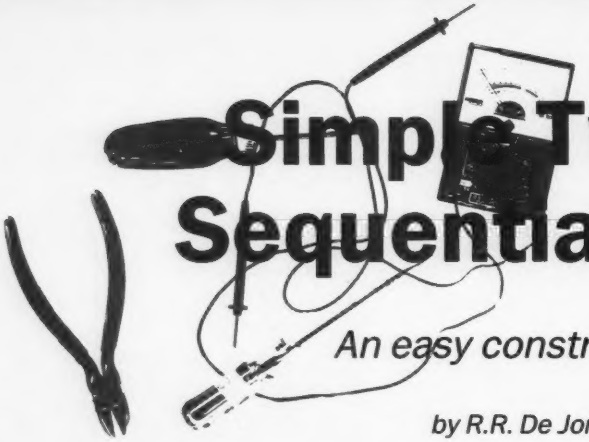


Photo D. The large box like unit is the cast aluminum transmitter chassis.

FT-747GX Specifications (as stated in the manual)

General		
Frequency Coverage		
Receive:	100kHz to	29.9999 MHz
Transmit:	1.5	1.9999
	3.5	3.9999
	7.0	7.4999
	10.0	10.4999
	14.0	14.4999
	18.0	18.4999
	21.0	21.4999
	24.5	24.9999
	28.0	29.9999
Modes: SSB/CW/FM/AM (FM is optional)		
Tuning Steps:	SSB & CW is 25 Hz (2.5 kHz fast) AM is 1 kHz (10 kHz fast) FM is 12.5 kHz	
Frequency Stability:	± 200 Hz AM/SSB/CW (± 300 Hz FM) (0 to 40 degrees C)	
Antenna Impedance:	50Ω	
Power Requirements:	13.5 VDC at 19 A maximum	
Dimensions:	238 x 93 x 238mm (without knobs)	
Weight:	3.3kg (7.25 lbs)	
Receiver		
Circuitry:	Double conversion superheterodyne	
IF Frequencies:	1st IF 47.055 MHz 2nd IF 8.215 MHz	
Sensitivity:	SSB/CW for 10 dB S/N 500 kHz-1.5 MHz less than 0.5μV 1.5 MHz and up less than 0.25μV AM for 10 dB S/N 500 kHz-1.5 MHz less than 1μV 1.5 MHz and up less than 2μV FM for 12 dB SINAD above 28 MHz 0.7μV	
Squelch Sensitivity:	500kHz-1.5 MHz is 2μV 1.5 MHz and up is 4μV	
Selectivity:	SSB/CW 2.2kHz/-6 dB (5.0kHz/-60 dB) CW/Narrow 500Hz/-6dB (1.8kHz/-60 dB) AM 6kHz/-6 dB (14kHz/-60 dB) FM 8kHz/-6 dB (19kHz/-50 dB)	
Image Rejection:	better than 70 dB (1.5-30 MHz)	
IF Rejection:	better than 60 dB (1.5-30 MHz)	
Audio Output:	4-8Ωs	
Transmitter		
Output Power:	SSB/CW/FM 100 W PEP AM 25W	
FM Deviation:	± 2.5KHz	
Spurious Radiation:	better than -50 dB	
Carrier Suppression:	better than 40 dB	
Unwanted Sideband Suppression:	better than 50 dB	
Microphone Impedance:	500-600Ω	



Simple Two-Tone Sequential Encoder

An easy construction project

by R.R. De Jongh WB7CPT

Could I build a simple-cheap-compact encoder? After acquiring some pager parts from a surplus buy, I managed to put together a working MINITOR™. I searched through my crystal "bank" to put the pager on a two meter simplex frequency. Since this is a tone and voice pager, it makes an excellent monitor receiver, with 0.25µV sensitivity. The tone capability also aroused the builder instinct in me. The circuit is a result of several tries, and almost as many dead ends. The 555 type IC's just do not have the frequency stability required for the job.

Component of Choice

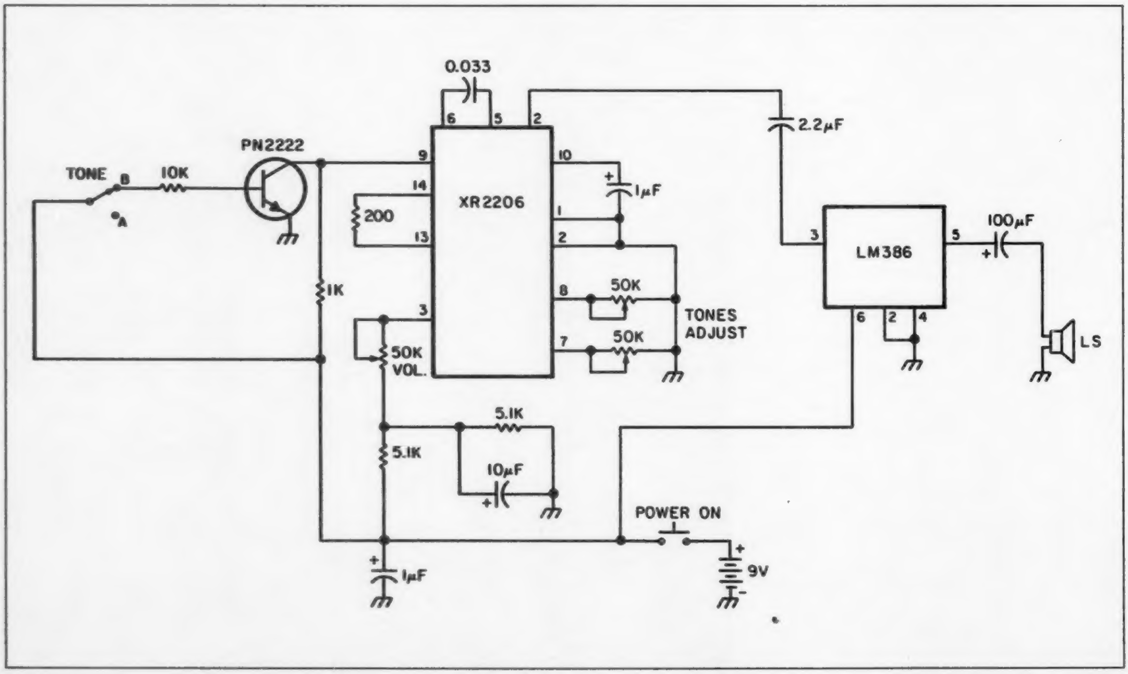
The XR2206 does the job well and also has AFSK capabilities. This circuit is quite simple. Just connect some pots to set the A and B frequencies, select a suitable range capacitor and then supply logic levels to pin 9 to select a tone. I didn't use timers to set tone times and to sequence the tones. Timers can be used by guesstimation, a second or so on the first tone and about the same for the second tone. If the experimenter decides to add in a timing circuit, perhaps a 556 CMOS type, try about a half of a second on the first and about a second or two on the second tone. There should be a gap of about 100 msec between the tones.

Easy Operation

The method I used worked well by holding the speaker right up to the mike or HT and pushing in the power switch with the A enabled. Hold it for a second and then toggle the tone switch to the B tone and hold for two seconds. Because the switch goes through a momentary open, there's a natural gap in tones.

Some pagers have a special chip added in their decoder that furnishes a "group" alert. This can be accessed by a long continous B tone, one over six or more seconds. The pager sounds the alert with a solid tone, instead of the usual beep.

Parts are not critical. Frequencies are set with the pots on pins 7 and 8, and the capacitor between pins 5 and 6. Any decent NPN transistor will do. The voltage used could be 12 or 13.8 volts as well as 9 volts. The frequency may be set with a counter across the speaker terminals. If a frequency or modulation monitor is available, set the deviation to about ± 3 kHz with the speaker right up to the mike of the transmitter.



The simple two-tone sequential encoder.

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HBX-56	56'self supporting [10 sq.ft.]	$392.50
HDBX-40	40'self supporting [18 sq.ft.]	$284.50
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TH3JRS	3 element 'Junior Thunderbird'
TH5MK2S	5 element 'Thunderbird'
TH2MK3S	2 element 'Thunderbird'
TH7DXS	7 element 'Thunderbird'
TH6DXX	conversion kit to TH7DXS
EXP 14	Explorer 14 triband beam
QK710	30/40 M conv. Exp 14

Monoband

103BAS	'Long John' 3 element 10 mtr
105BAS	'Long John' 5 element 10 mtr
155BAS	'long John' 5 element 15 mtr
204BAS	4 element, 20 meter $299.90
205BAS	'Long John' 5 element 20 mtr
7-1S	'Discoverer' rotary dipole 30/40mtr
7-2S	'Discoverer' 2 elem. 40 meter beam.
7-3S	converts 7-2S to 3 elem. beam

Multiband Verticals

18HTS	'Hy-Tower' 10 thru 80 meters
14RMQ	roof mt kit for 12 AVQ,14AVQ and 18ATV/WB
18VS	base loaded, 10 thru 80 meters
12AVQS	trap vertical 10 thru 20 meters
14AVQ/WBS	trap vertical 10 thru 40 meters
18AVT/WBS	trap vertical 10 thru 80 meters

Multiband Doublets

18TD	portable tape dipole 10-80 meters
2BDQS	trap doublet 40 and 80 meters
5BDQS	trap doublet 10 thru 80 meters

VHF ANTENNAS **Beams & Verticals**

23BS	2 meter 3 element beam
25BS	2 meter 5 element beam
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214BS	2 meter 14 element beam
64BS	4 element 6 meter beam
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V-3S	colinear gain vertical 220 MHz
V-4S	colinear gain vertical 430-470 MHz
GPG2A	base, 2 mtr. ground plane 3 dB

VHF & UHF Mobiles

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HB144GRI	HyBander 2mtr 6dB gain 3/8-24 mt.
HB144MAG	HyBander 2 meter
BN86	ferrite balum for 10-80 meters

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A744	7 & 10 MHz add on kit for A4	$81.00
4218XL	18 element 2 mtr, 28.8' boomer	$125.00
A4S	4 element triband beam	$344.00
AV4	40-10 mtr. vertical	$94.50
AV5	80-10 mtr. vertical	$111.00
ARX2B	2 mtr. 'Ringo Ranger'	$39.25
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A147-22	22 element 'Power Packer'	$141.75
A144-10T	10 element 2 mtr. 'Oscar'	$54.00
A144-20T	20 element 2 mtr. 'Oscar'	$77.50
215WB	15 element 2 mtr. 'Boomer'	$81.00
220B	17 element FM 'Boomer'	$101.25
230WB	144-148MHz, 30 element	$216.00
32-19	19 element 2 mtr. 'Boomer'	$101.25
424B	24 element 'Boomer'	$81.00
10-4CD	4 element 10 mtr. 'Skywalker'	$124.75
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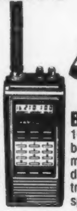
uniden Bearcat



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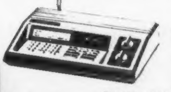
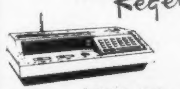


BC145XL . . $92.90

16 Ch 10 band, programmable, built-in delay, review, priority, memory backup, Ch lockout, direct Ch access, weather search, track tuning, AC/DC, external speaker & antenna jacks.

BC50XL	10 Ch 10 band w/batt pack charger	$119.90
BC70XLT	20 Ch 10 band hand held,	$159.90
BC100XLT	100 Ch 11 band, hand held, aircraft	$199.90
BC200XLT	200Ch 12 band 800MHz Hand Held	$299.90
BC175XL	16 Ch 11 band, aircraft, AC/DC	$159.90
BC210XLT	40 Ch 11 band, weather, aircraft AC/DC	$179.90
BC560XLT	16 Ch 10 band mobile w/bracket	$99.90
BC580XLT	100 Ch 11 band mobile, weather, air	$219.90
BC760XLT	100 Ch 12 band w/800MHz mobile	$279.90
BC800XLT	40 Ch 12 band 800MHz, AC/DC	$239.90

Regency

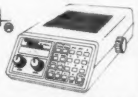


Z45 . . . . . $119.90

45 Channel 7 band, w/aircraft, programmable, 45 pre-programmed Channels, search or scan, alarm clock, priority, permanent backup, ch lockout, scan delay, AC/Dc with both cords.

HX1500 . . . . $209.90

Hand held, 55 Ch 11 band, aircraft, Ch lockout, scan delay, w/ AC adapter/charger battery pack & carry case.



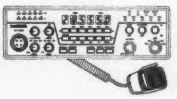
TS2 . . . . . $269.90

75 Channel 12 band 800 MHz, aircraft & weather, Turbo Scan®, bank scanning, instant weather, programmable, accuseek permanent backup, direct access, with AC adapter, DC cord & mobile Mt bracket.

TS1 . . . . $199.90

35Ch 11 band weather & aircraft, AC/DC.

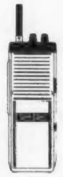
RANGER



10 meter transceiver, 25 watt, can be programmed to split transceive, SSB, CW, AM, FM, programamble scanning, fully automatic noise blanker, 2½H, 7¾W, 11D.

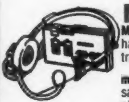
AR3500 . . . . $334.90

REGENCY LAND MOBILE



Utili-Com, 1 watt/2 Ch 2-way, lightweight, battery operated portable, w/flexible antenna, plastic case & battery charger. Supplied with itinerary frequency 151.625.

UC102 . . . . $139.90



MAXON....$26.95

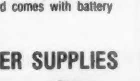
Model 49SA - 49 MHz, FM 2-WAY RADIO

hands free operation, voice activated transmit up to ½ mile. Batteries optional

model 49B $34.95

same features as 49SA except uses ''AA'' nicad batteries and comes with battery charger

TENNA PHASE III POWER SUPPLIES



PS3 . . . . $15.90

Output:13.8V DC - 3 amp constant 5 amp surge, electronic overload protection w/instant auto reset, fuse protected.

PS4 . . . . $19.90

Fully regulated, 13.8 VDC - 4 amps constant with surge protection, overload protection w/instant auto reset.

PS7 . . . . $24.90

Fully regulated, 7 amp constant,10 amp surge capacity.

PS12 . . . . $34.90

Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset.

PS20 . . . . $64.90

Fully regulated, 25 amp surge capacity, 13.8 VDC, 20 amp constant, with meter.

PS25 . . . . $79.90

Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.

PS35 . . . . $99.90

Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts.

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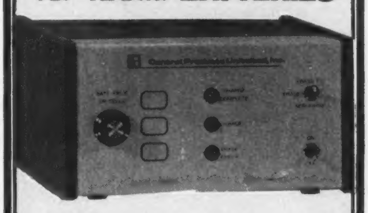

- Automatically erases memory and rapidly charges NiCad batteries up to 15 Volts.
- Allows batteries a long life with maximum capacity.
- Helps restore a tired battery.
- Full 2 year warranty.
- Cost effective, saves money.
- Ponce de León never had it so good.

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8237 RG8	42¢/ft.
8267 RG213	59¢/ft.
8262 RG-58 c/u milspec	18¢/ft.
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8448 8 conductor rotor cable	35¢/ft.
9405 as above but HD—2-16ga, 6-18ga	60¢/ft.
8403 Mic cable 3 condctr & shield	70¢/ft.
9258 RG 8X	21¢/ft.

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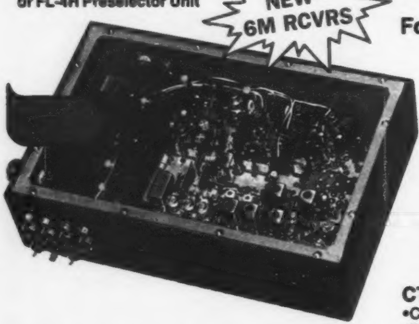
For 10M, 2M, 220 MHz, & 440 MHz

New FL-4 UHF Helical Resonators

Installed in Receiver or FL-4H Preselector Unit

NEW— 6M RCVRS



COMPLETE SHIELDED RCVR. ASSY.

VHF & UHF Receiver Boards

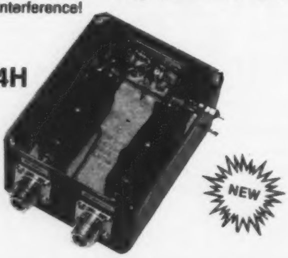
SCR200A-VHF SCR450A-UHF

- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—Reduces Overload, Spurious Resp. & Intermod.
- Sens. 0.25 µV/12dB SINAD typ.
- Sel. -6dB @ ± 6.5 KHz. -130dB @ ±30KHz. (8 Pole Crystal + 4 Pole Ceramic Fltrs.
- 'S Meter', Discriminator & Deviation Mtr. Outputs!
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. (*"Super Sharp" IF Fltr. also avail.*)
- ***New! 30 KHz B.W. IF Filter for High Speed Packet.***

Complete Receiver Assemblies

- Rcvr. Board mounted in shielded housing.
- Completely assembled & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000. Ready to drop into your system!
- UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!

FL-4H



Receiver Front-End Preselectors

- **FL-6: 6HI Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz)**
- **FL-4H: 4HI Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
- Extremely helpful at sites with many nearby transmitters to "filter-out" these out-of-band signals.

Call or Write for Data Sheets

ID250A CW ID & Audio Mixer Board

- **Improved! Now includes "audio mute" circuit and "Emergency Power ID" option.**
- 4 input AF Mixer & Local Mic. amp.
- PROM Memory—250 bits/channel.
- Up to 4 different ID channels!
- Many other features. Factory programmed.

CTC100 Rptr. COR Timer/Control Bd.

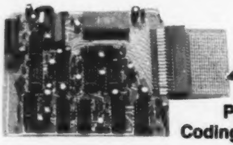
- Complete solid state control for rptr. COR,"Hang" Timer, "Time-Out" Timer, TX local & remote Shutdown/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

Power Supply Boards

NEW

- **SCP12** 12 VDC @ 0.3A MAX. OUT.
- **SCP512** 12 VDC @ 1A & 5VDC @ 0.4A out. (1.1A total max. out.)
- **SCP512A** As above, but also w/−12VDC @ 0.1A

NEW



Plug-in Coding Card

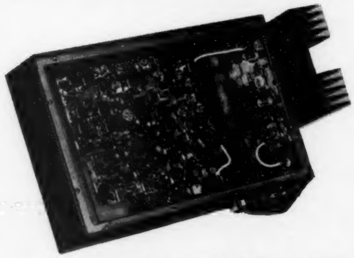
TTC300 TOUCH TONE CONTROLLER

- High performance, Super versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
- Uses new high quality Xtal Controlled Decoder IC, w/high immunity to falsing
- Decodes all 16 digits
- 3 ON/OFF Functions per Main Card. Easily expandable to any no. of functions w/Expansion Cards.
- Codes quickly field programmable via plug-in Coding Cards. Many unique 3-digit codes available. Not basically 1-digit as with competitive units.
- Latched or pulsed outputs.
- Transistor Switch outputs can directly trigger solid state circuitry or relays, etc. for any type of control function.
- Low Power Consumption CMOS Technology. 5VDC Input. Gold-plated connectors.

NEW

SCP30 HEAVY DUTY 30 AMP RACK MT. POWER SUPPLY

- 13.8 VDC out. 115/230 in, 50/60 Hz.
- 30A @ 70% duty, 25A @ 100% duty.
- Massive 30 lb. Transformer & Heat Sinks.



Improved SCT410B Transmitter Assy.

SCT110 VHF Xmtr/Exciter Board

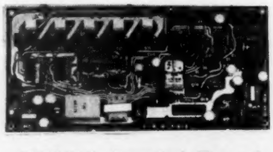
- **10 Wts. Output. 100% Duty Cycle!**
- Withstands High VSWR
- True FM for exc. audio quality
- Designed specificially for continuous rptr. service. Very low in "white noise."
- Spurious − 75 dB. Harmonics − 60 dB.
- With .0005% precision grade xtal.
- **BA-30 30 Wt. Amp board & Heat sink,** 3 sec. L.P. filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available**

SCT110 Transmitter Assembly

- ***SCT110 mounted in shielded housing***
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. UHF AMP. BD. & HEAT SINK**



SCAP Autopatch Board

- Provides all basic autopatch functions
- Secure 3 Digit Access; 1 Aux On-Off function, Audio AGC; Built-in timers; etc. Beautiful Audio!
- 0/1 inhibit bd. also available
- Write/call for details and a data sheet

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- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land-line "answering" circuitry

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- Gas Discharge Tube shunts phone line surges to ground
- Handles up to 40,000 Amps!
- The Best device available to protect Autopatch equipment from lightning damage. $17.00 + S/H.

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R-71A	Hi performance receiver The DXers Choice!!!	999.00	859.95
R-7000	25-2000 mHz scanning rcvr The Super Scanner!!!	1199.00	1029.95
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IC-27H	45w version of above	459.00	389.95
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IC-47A	25w 440 mobile with DTMF mic	549.00	469.95
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IC-03AT	2.5w 220 HT/ctcss/DTMF Great for novices!!!	449.00	389.95
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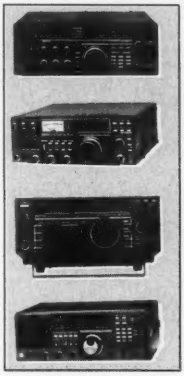

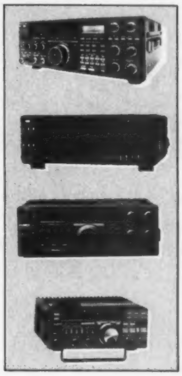

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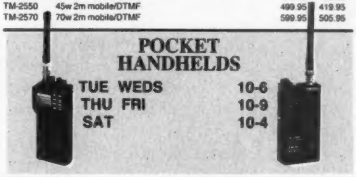

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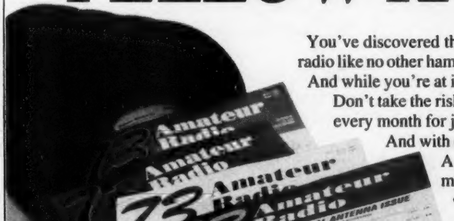

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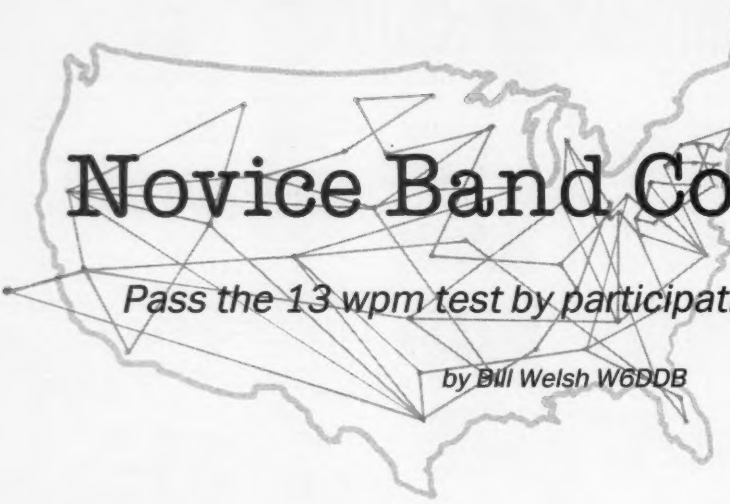

Novice Band Code Nets

Pass the 13 wpm test by participating in code nets

by Bill Welsh W6DDB

One of the best ways to increase code proficiency is to participate in code nets. Novice and Technician operators can quickly pass the required 13 words-per-minute General and Advanced code test by regularly participating in code nets.

Most nets serve their immediate area. Consequently, the nets listed in this article are alphabetically arranged by states, using the two letter postal service indicators. Some nets just serve one or two counties in a state. Consider operating in one of the area nets shown after the state nets, if there isn't an active net in your area.

The name of each net is followed by the abbreviated identification that is normally used on the air. As an example, the identification code for the New England Novice Net is NENN.

The net frequency is stated in kilohertz. No one owns a frequency, not even a regularly scheduled net. If the stated net frequency is in use by non-net amateurs, the net will be found a few kilohertz above or below the stated frequency.

The net operators are listed according to the following weekly system: D is daily (including weekends); Sn is Sunday; M is Monday; T is Tuesday; W is Wednesday; Th is Thursday; F is Friday; and S is Saturday.

A Sense of Time

Net start time is shown in Universal Time Coordinated (UTC). UTC is 4, 5, 6, and 7 hours ahead of Eastern, Central, Mountain, and Pacific Daylight Savings Times, respectively in the Summer. UTC is 5, 6, 7, and 8 hours ahead of Eastern, Central, Mountain, and Pacific Standard Times, respectively in the Winter. This list was prepared showing UTC net times, based on summer (daylight savings) schedules. Some nets shift their start time when their local time changes between standard and daylight savings times. If a net can not be heard at the indicated time, listen for it one hour later or earlier, (as appropriate) to compensate for a possible change in local time.

A net starting time shown as 0030 UTC (for example) would probably shift to 0130 UTC during the Winter, when standard time is being used. Remember that several states do not use the daylight savings system. Also remember that a net scheduled to start at 0300 UTC Sunday (as an example) actually starts Saturday evening, local time. Some nets suspend operations during the Summer, when member participation is minimal.

The purpose of each net is listed according to the following system: A is Area National Traffic System (NTS); E is Emergency Preparedness; L is Local NTS, O is Other; R is Regional NTS; S is Section NTS; T is Traffic Handling; and W is Weather.

The callsign of the Net Manager is listed, if it is known. Any correspondence regarding a net should be sent to the net Manager. The Novice band code nets listing is an updated list of the one printed in the December 1982 *CQ* Novice column. Every known net Manager was asked (in writing) to let us know about the changes made to the listed data. Less than one-half of the net Managers provided confirmation of correct information, plus the changed data. It would be greatly appreciated if readers would supply corrections and/or additions (in writing) to me (W6DDB), at 2814 Empire Ave., Burbank, CA 91504. Your ARRL Section Manager is an excellent source of information regarding local nets; she/he is listed on page eight of each *QST* magazine.

The February 1980 *CQ* Novice column contains a list of the three letter Q-signals, most commonly used by amateurs to make statements and to ask questions. A free copy of that list is available to anyone who requests it and supplies a self-addressed stamped envelope. The ARRL also publishes a handy reference card with Q and procedural signals. Some Q-signals apply only to net operation: Those Q-signals are listed in this article to make it easier for new amateurs to participate in net operations. These Q-signals were developed by the ARRL specifically for code net usage. They are not intended to be used during casual (non-net) on-the-air conversations, nor are they to be used in voice nets. Unlike the regular Q-signals, these code net Q-signals do not need to be followed by a question mark when a question is being asked. See the sidebar.

AL Alabama Emergency Net D (AEND)			
3725	D	2330S	N4DCS
CA Braille Institute QRS Net (BRL)			
7105	S/Sn	19000	WB6ZPN
CA San Diego Section ARES Net (SDN)			
3725	S	2330T	N6LYX
CA Tuolumne County Novice Emergency Net (TNEN)			
3710	Sn	2230EOT	WB6SLX
(Serves Northern California)			
CO Colorado-Wyoming Net (CWN)			
3715	D	0130S	KB0Z
CT Connecticut Slow Net (CSN)			
3720	T/W/Th/F/S	0030S	WB1GXZ
CT CQ Radio Club Novice Net			
28125	Th	0000OT	K1BCI
CT Slowfist Net			
21150	T/Th	0100EOT	N2CYU
DE Diamond State Slow Net (DSSN)			
3735	T/Th	0030S	KA3DPR
FL All Florida Slow Traffic Net (QFNS)			
3714	D	0100S	KA4SIH
FL Florida Medium Speed Net (FMSN)			
3651	D	2130S	WD4KBW
FL Platinum Coast Novice Net (PNN)			
28119	W	2330T	KB4GIA
(Brevard County)			
GA Georgia Training Net (GTN)			
3718	M/W/F	2315S	W0MHG
HI Maui Emergency Net (MEN)			
7120	T	0700EOT	WKH6H
IA Iowa Code Net (ICN)			
3705	T/Th/S	0100S	NO0J
IL Illinois Training Net (ITN)			
3705	D	0100ST	WB8RFB

IN Indiana Code Net (ICN)
3705 D 2315S KW9D
KS Kansas Slow Speed Traffic Net (QKSSS)
3735 T/Th/S 0030S W0MYM
KY Kentucky Novice Training Net (KNTN)
3727 D 0000S KB4OZ
LA Louisiana Slow Net (LSN)
3703 M/T/W/Th/F 0030S WD5CWK
MA Eastern Massachusetts/Rhode Island Slow Net (EMRISS)
3715 D 0130/2100 SKA1EXJ
MD Maryland Slow Net (MSN)
3717 D 0030S KC3Y
MD Maryland Training Net (MTN)
3735 M/T/W/Th/F 0030S K3ORW
MI Kalamazoo Civil Defense CW Training Net
28120 Th 0130T K8OQB
MI Michigan Novice Net (MNN)
3722 D 0100/2230 SKA8NCR
MN Minnesota Slow Speed Net (MSSN)
3710 D 2300S KA0SBY
MN Paul Bunyan Wireless Association Net
28133 M 0300L KC0YG
MO Chariton Valley Emergency Net (CVEN)
3712 T/Th/Su 2330L W0OTF
MO Missouri Traffic and Training Net (MTTN)
3730 M/T/W/Th/F/S 2330 SKA0SUN
MS Mississippi Slow CW Net (MSN)
3733 M/T/W/Th/F 0000S KD5TY
NC Carolinas Slow Net (CSN)
3715 D 2300S AA4MP
ND North Dakota Slow Net (NDSN)
7145 S 2300T KO0L
NE Nebraska Novice Net (NNN)
3737/Winter D 0200S WD0BOX
7137/Summer
NJ New Jersey Slow Net (NJSN)
3735 D 2330S WB2PKG
NJ Slowfist Net
21150 T/Th 0100EOT N2CYU
NY Mohawk Valley Training Net (MVTN)
21150 W/F 0000OT KA20QB
NY New York Training Net
3720 D 0130O KA2DQA
NY Slowfist Net
21150 T/Th 0100EOT N2CYU
OH Ohio Novice Net (ONN)
3708 D 2330T NM8I
OH Omik Slow Code Net (OSCN)
21110 Th 0200 WD8KAV
OH Triple States High Speed Net (TSRAC)
28480 Th 0130L KA8KOS
OH Triple States Intermediate CW Net (TSRAC)
28480 Th 0100L KA8KOS
OH Triple States Slow Net (TSRAC)
28480 Th 0030L KA8KOS
OK Oklahoma Liaison Net (OLZ)
3705 D 0030S W5UYH
PA Keystone Slow Speed Net
3730 M/T/W/Th/F 2330OS KA3NQA
PA Lehigh Valley Net (LVN)
3740 S 2130S
PA Triple States High Speed Net (TSRAC)
28480 Th 0130L KA8KOS
PA Triple States Intermediate CW Net (TSRAC)
28480 Th 0100L KA8KOS
PA Triple States Slow Net (TSRAC)
28480 Th 0030L KA8KOS
RI Eastern Massachusetts/Rhode Island Slow Net (EMRISS)
3715 D 0130S N1BHH
SC Carolinas Slow Net (CSN)
3715 D 2300S AA4MP
SD South Dakota Novice CW Net
3725 S/Sn/M/T 0100T KA0UEH
SD Walworth County Emergency Net
3740 Sn 1830ET W0YMB
TN Tennessee Slow Net (TSN)
3702 M/T/W/Th/F 0000S N4OZB
TX Crackle and Bang Instruction Net (CABIN)
3725 M/T/W/Th/F/S 0300 KB5ADE
TX Texas Slow Net (TSN)
3745 D 0100S KB5ADE
UT Utah Code Net (UCN)
3710 D 0230S NS7K
WI Wisconsin Novice Net (WNN)
3723 D 0000S N9DGL
WV Triple States High Speed Net (TSRAC)
28480 Th 0130L KA8KOS
WV Triple States Intermediate CW Net (TSRAC)
28480 Th 0100L KA8KOS
WV Triple States Slow Net (TSRAC)
28480 Th 0030L KA8KOS
WV West Virginia Novice Net (WVNN)
3730 D 2215ST WD8LDY
WY Colorado-Wyoming Net (CWN)
3715 D 0130S KB0Z

Area Nets

East and Middle U.S.A.
Early Bird Net (EBN)
3715 D 1100 T NG4J
Eastern U.S.A.
Hit and Bounce Slow Net (HBN)
7040 D 1330 T K2GWN
Gulf States and West Indies
Novice Gulf Coast HN (NGCHN)
21190 D 2300 W KA5ILR
Maritimes
Cape Breton Net (CBN)
3735 Sn 1730 S
Nationwide
Planetary Citizen Novices Net
21110 T/Th 2100 EOT WA6KFA
Nationwide
Transcontinental Novice Net (TNN)
21110 M 2300 O(QRP) WA2KSM
New England
New England Novice Net (NENN)
3720 D 1015 OT KA1KML
Northern States
Young Amateurs Net (YAN)
7135 T/F/Sn 2345 OT KA2KVZ
Northwest U.S.A. and British Columbia
West Coast Slow Speed Net (WCN)
3702 D 0300 EOT WB7RKU
West Indies
West Indies Net - Slow (WINS)
3710 D 2300 S KP4DJ

Special Q Signals for Net Use

QNA	*Answer in prearranged order.
QNB	*Act as relay between . . . and . . .
QNC	All net stations copy. I have a message for all net stations.
QND	*Net is directed (controlled by net control station).
QNE	*Entire net stand by.
QNF	Net is free (not controlled).
QNG	Take over as net control station.
QNH	Your net frequency is high.
QNI	Net stations report in* I am reporting into the net. (Follow with a list of traffic or QRU.)
QNJ	Can you copy me? Can you copy . . .?
QNK	*Transmit messages for . . . to . . .
QNL	Your net frequency is low.
QNM	*You are QRMing the net. Stand by.
QNN	Net control station is . . . What station has net control?
QNO	Station is leaving the net.
QNP	Unable to copy you. Unable to copy . . .
QNQ	*Move frequency to . . . and wait for . . . to finish handling traffic. Then send him traffic for . . .
QNR	*Answer . . . and receive traffic.
QNS	Following stations are in the net.* (Follow with list.) Request list of stations in the net.
QNT	I request permission to leave the net for . . . minutes.
QNU	*Establish contact with . . . on this frequency. If successful, move to . . . and send him traffic for . . .
QNV	*Establish contact with . . . on this frequency. If successful, move to . . . and send him traffic for . . .
QNW	How do I route messages for . . .?
QNX	You are excused from the net.* Request to be excused from the net.
QNY	*Shift to another frequency (or to . . . kHz) to clear traffic with . . .
QNZ	Zero beat your signal with mine.

***For use only by the Net Control Station (NCS).**

Number 8 on your Feedback card

73 Review *by Bryan Hastings KA1HY*

GGTE Morse Tutor

For PC owners at any *code level.*

GGTE
21881 Summer Circle
Huntington Beach CA 92646
Price Class: $20

How does someone learn Morse Code without a partner?

Easy Installation

Morse Tutor is the brainchild of Warren Hoffnung KF6VV. This, the Version 2.1 program, runs on any MS-DOS or PC-DOS computer, with as little as 128K of RAM. The printed instructions accompanying the program disk show in detail how to install Morse Tutor on either a hard disk or floppy. They even give a DOS batch program for a hard disk system, by which one can run the program with a single DOS command from any directory (given the proper PATH settings). They also show how to make a working copy of the program.

Since PCs and clones have different internal clock speeds, such as 4.77, 6, and 8 MHz, Morse Tutor has a routine to match the program timing with the clock speed of the code-learner's particular machine. This calibration takes several minutes to perform, and is automatically saved to disk—a proper calibration needs to be done only once for a given computer. One caveat: Don't put a write-protect tab on the working copy, since the computer writes to the disk during calibration.

Tale of Two Methods

Morse Tutor offers the user a choice between two methods of Morse code instruction—Standard and Farnsworth. The first method keeps the time elements between "dits" and "dahs," characters, and words, all in the same proportion. When the sending rate increases, for example, the time periods between "dits" and "dahs," characters, and words, all shorten proportionally.

The latter—and increasingly more accepted—method allows independent character and word speed settings. This is the default setting. This system recognizes that many CW students quickly go from adding dits and dahs together to identifying the character only by its unique sound. Curious evidence of this comes from hams who are unable to copy Standard code much slower than their present level!

With the Farnsworth method, the learner can set the character speed at the goal speed, which means he need not relearn a new sound for the same character as his copy rate picks up. Furthermore, the listener need concentrate only on shortening the spaces between characters and words.

The Characters Themselves

Morse Tutor first presents the alphabet, and then the numbers 1–9, 0, punctuation, and prowords (telegraphy-specific codes), all in 11 groups of four characters. The first group presents "A" ("di-dah"), and "N" ("da-dit"). These simple dah-and-dit juxtapositions clarifies their different sounds to the beginner. "S" and "O" ("di-di-dit" and "da-da-dah") are sent in the same group. The next six groups presents the rest of the alphabet in progressively more complex combinations of dits and dahs, always taking care to put those with similar (i.e. easily confusable) patterns in the same group, again to clarify them to the student. The learner can select, however, the group to which he wants to listen.

Morse Tutor presents each group in three parts. The first segment sends each of the four lesson characters five times, while displaying the ⅓-screen size character. The second sends this group's characters randomly. The final segment sends random words composed of the characters. Segment Three in Lessons Two–Nine sends words composed of characters from the first group up to, and including, the present. Like the groups, the student is completely free to choose any segment, regardless of order.

There is a minor drawback in Segment Two. The characters are sent in long strings, making it difficult for the copier to compare his copy with the screen display. Organization of these strings into short groups, say, five characters long, would ease copy verification.

Also For Upgraders

Morse Tutor shines in Lesson 12. Here, a random QSO (conversation) is sent, closely patterned off the amateur radio exam QSO. It lasts for ten minutes, and can be cancelled any time before then. The student can view the text on the screen as it is sent, or choose to see it only after the QSO finishes (or is terminated). At higher speeds it will even send a response QSO!

Conclusions

GGTE Morse Tutor is a *very* well thought-out program. PC and clone neophytes can easily use it. One could rely totally on the program after initialization, but I suggest also reading the manual—it's sprinkled with interesting code-learning tips. The user is free to learn CW by the Standard or Farnsworth method, set any speed up to 100 wpm, set any audible sidetone pitch, and go through the lesson groups—and segments within the groups—in any order. Rank beginners, however, need not be frightened by too many choices. Tone pitch, character rate, and word rate all have sensible default settings—just skip through that menu and follow the lessons.

Best of all, Morse Tutor replaces your Elmer in two critical areas—it chooses one of billions of possible random QSO combinations to send, making them impossible to predict, and it lets you immediately check copy accuracy.

Don't be tempted here by the psychology that rates the worth of a product by its price tag. Morse Tutor is, quite simply, a superb value.

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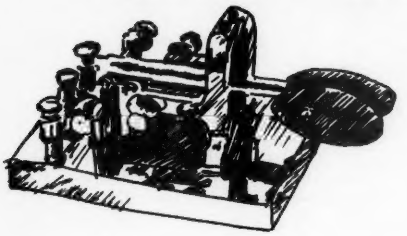
How to Improve Your Code Speed



Yes, you can!

by Edward F. Rice W9NGP

Not being a high speed CW operator, I still love the mode and work mostly CW on the air. Before I went for the 13 wpm exam, it took a couple of *years* of daily CW practice, and then I barely made it.

After several decades of struggling to improve my code speed, I have discovered some methods that worked well for me. I will pass those methods along in this article.

• 1. Develop a vocabulary of words that can be recognize without copying the letters.

Many words have a unique sound when sent by CW. Try sending these words briskly and hear how they sound:

cycle little remember
between field needed
beginning antenna highest

There are hundreds of words that are easily recognized by their rhythm without even copying the letters.

If using a typewriter, words are often typed by initiating a sequence of finger movements controlled by a program stored in the subconscious. This causes the brain not to think about the individual letters. It's the same with copying CW; it increases the speed because of the less work the brain has to do. The more words that can be recognized, the faster and easier CW becomes. By sending words into my tape recorder and playing them back, I increased my vocabulary speed. I allowed a few days for the words to fade from my conscious memory, and I tried sending the words a little faster than my normal receiving speed. I kept the spacing between words the same as in a regular sentence. This required me to listen to the next word while trying to spell out the hard copy for the word I had just recognized. Copying behind like this teaches one not to anticipate words from the first few letters, and to watch for endings like "ing," "ly," and "ed," which change the meaning.

• 2. Pay close attention to what is coming next.

Of course, every word can not be recognized, so the letters have to be copied at times. One of the hardest obstacles I had to overcome was my insistence on copying every letter. If I missed one letter, I would get stuck thinking about it and miss the whole word, sometimes even the next two or three words.

Copying Morse code is like reading somebody's handwriting. Often letters are scribbled illegibly, but the word can still be made out. When a letter of code is missed, due to interference, poor sending, or a slight lapse of concentration, focus on what letter is coming next. The word can usually be made out after learning the rest of the letters. If a letter is missed, forget it. Never look back, not even for an instant.

To forget about a character sounds easy, but it isn't. Amateurs hate to let go of anything when they perceive that it may be recovered. Copying CW is *not* like a ball player who bobbles a catch and reaches for it again successfully. Once a letter of CW is lost, it is gone forever. And if it is chased after, more letters will be lost. Chasing after lost letters is one of the worst habits an amateur can have. Never look back!

• 3. Use a tape recorder to review the copy sent.

This step is an easy one, because it doesn't require any mental training. Simply record the practice material as it is sent, then play it back and follow the words on the copy. To note the places where there is a stumble in the copy, helps to improve the receiving ability. Be aware of certain weaknesses that cause a combination to become repeatedly missed. Some types of combinations frequently missed are abbreviations, punctuation, numbers, or words with "ie" and "sh." One code that always catches me is the letter R, used for a decimal point in a number.

Using the tape recorder is also a very good way to improve sending. Send text into the machine for 10 minutes and then, a few days later, replay the CW and try to copy it. Many irregularities will be found that make sending more difficult to copy. Morse code that sounds nearly perfect when sending may be loaded with flaws that are only noticed when copying.

• 4. Without making a hard copy, practice copying code mentally.

With eyes closed, just listen. Some amateurs can visualize the letters moving past their closed eyes like watching a computer readout. Others, like me, hear the words as if they were spoken by the sender.

This takes a while to learn and it's a little difficult to get started. Code can be easily read if it's been sent slightly faster than the normal slow sending. It's excellent practice and makes rag-chewing a pleasure when CW is mastered. Don't be dependent on pencil and paper.

• 5. Work with a friend whenever possible.

One reason why this is so important, is that learning to copy Morse code is a very frustrating endeavor. We all get discouraged and, seeing no progress, look for other activities which offer more immediate benefits, easier. But, fortunately, when amateurs work together, they do not become discouraged with code practice at the same time. So one amateur is able to help the other to keep practicing until his spirits are renewed.

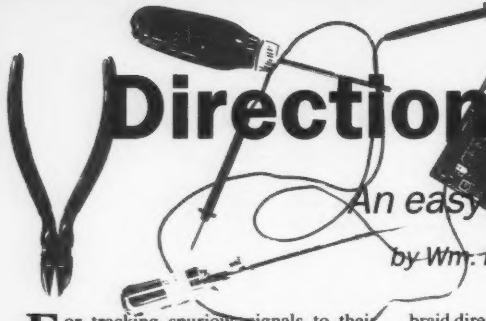
Psychologists assure us that the periods of boredom and frustration are always temporary. The interest and enthusiasm will return. When embarking on any regimen of training, whether physical or mental, progress seems to come in spurts. Before each noticeable immprovement, there are "plateaus."Psychologists and teachers use plateau to describe a person who is trying to learn, but nothing seems to be happening despite continued practice. This is when a friend is needed.

In learning to copy Morse code, the plateaus are clearly observed at certain speed levels. For most amateurs, the first one is around 5 wpm, when continuous practice yields no increase in speed. This lasts for a few weeks, then suddenly the speed jumps to 8 or 10 wpm. Other plateaus occur around 15, 25, and 35 wpm. It is best to be beyond the 15 wpm plateau when taking the 13 wpm test to overcome the stress of a test situation. When working with another amateur, don't spend practice time sending to each other. This wastes too much time, unless a CW keyboard or computer is available for perfect code and constant speed. Learning to send code is like learning to play a musical instrument. Nobody wants to listen to someone practicing.

Good use for practice time is achieved when both amateurs copy from a receiver or a machine and compare the copy later. Don't work more than one-half hour at a time. Two one-half hour sessions with a break in between is a good daily schedule.

In these paragraphs, I have tried to avoid making it seem easy. Learning Morse code is very hard and many who have not succeeded will say that it isn't worth the effort required. But no one who has mastered even a moderate code speed, would give up the sense of pride and pleasure that comes from CW contacts on the air. There is an empathy, an understanding between operators who each appreciate the effort the other has made to develop the skill required for them to communicate. For me this is the best part of amateur radio.

Number 10 on your Feedback card



Direction-Finding Loop

An easy home-brew project

by Wm. Bruce Cameron WA4UZM

For tracking spurious signals to their source, or for hidden transmitter hunts, the DF Loop is a useful gadget. The design is built around a bandaid box and uses BNC connectors to change the loop length to work on different frequencies. If the operator is going to use it on only one band, and flexibility is not needed, the builder can solder the braid directly to the can. However, once other hams are aware of the DF Loop, they will wish to borrow it, so plan on building a flexible one in advance.

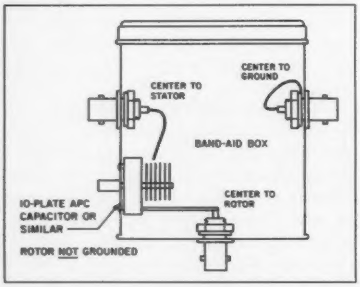


Figure 1. The bandaid tuning box.

For 146 MHz, a reasonable length is 34″. The tuning capacitor will resonate anything that is close, so the length is not critical. Note that the coax braid is separated at the top for half an inch or so.

I built this one on a four-foot piece of screen stock with an 8½″ tee at the top to help hold the RG58. With RG8, a tee is not needed since it is stiff enough to hold a roughly circular shape unreinforced.

In fancier models I have used broomsticks and made a window mount to support them. The operator can be as crude and dirty or as neat and fancy as he wishes, but the effect is the same.

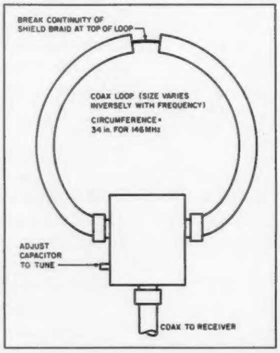

BREAK CONTINUITY OF SHIELD BRAID AT TOP OF LOOP
COAX LOOP (SIZE VARIES INVERSELY WITH FREQUENCY)
CIRCUMFERENCE= 34 in. FOR 146MHz
ADJUST CAPACITOR TO TUNE
COAX TO RECEIVER

Figure 2. The DF loop.

In use, the operator must first get close enough to hear a strong signal with the regular antenna. The loop should then be installed with maximum acceptance being crosswise. When the operator gets close enough to overload his receiver, he should turn edgewise and look for a null. If hunting a broad or wandering signal, it may be better off to use a super regenerative receiver. Modern ham receivers could be too narrow and they may become aggravating with constant retuning. 73

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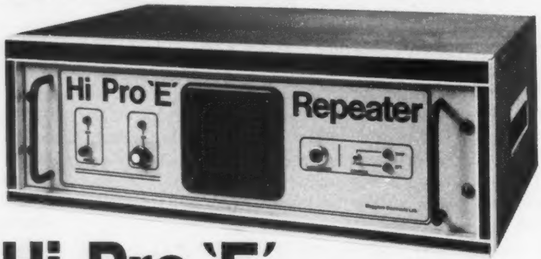

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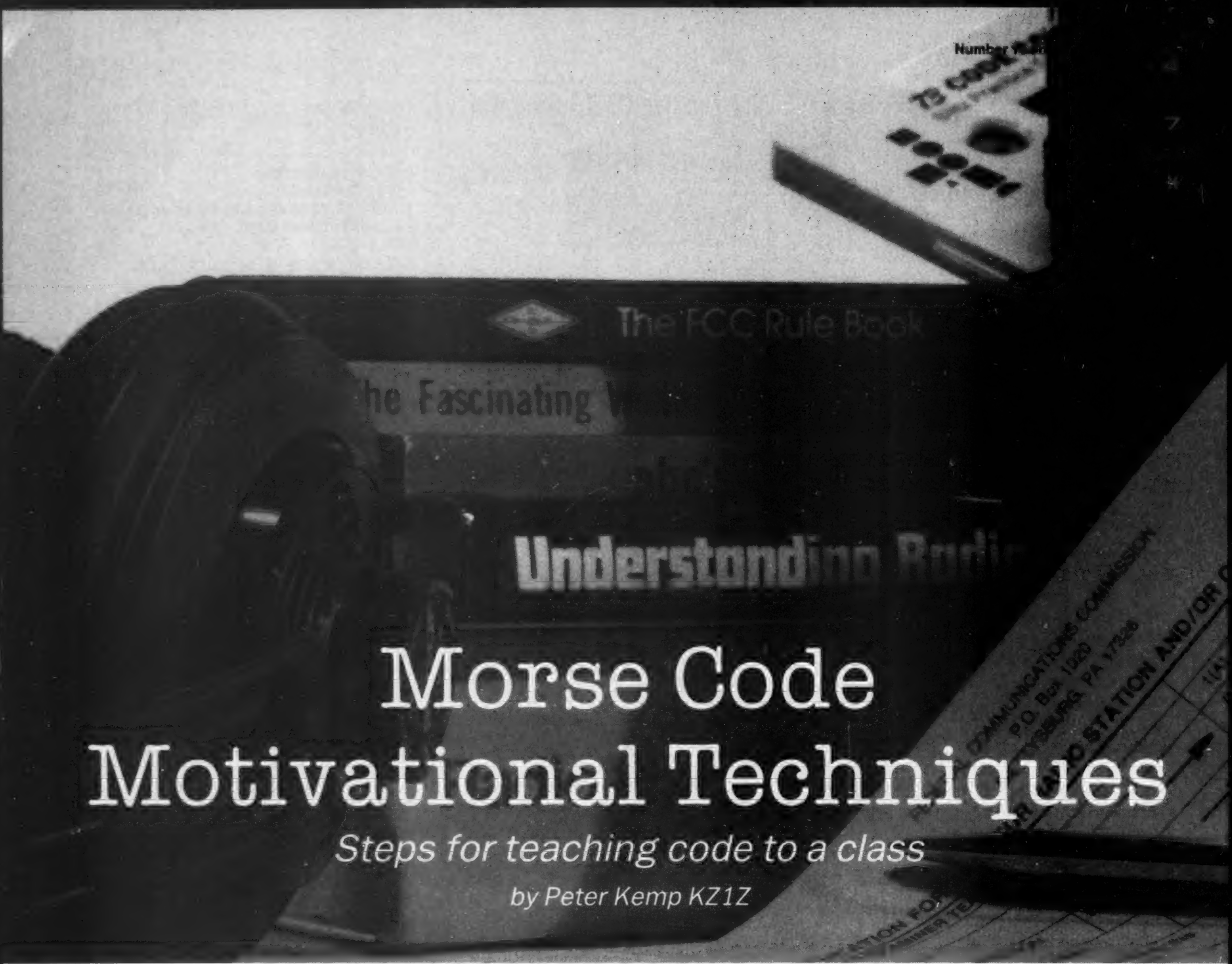

Morse Code Motivational Techniques

Steps for teaching code to a class

by Peter Kemp KZ1Z

While there are many valid methods for teaching the Morse code, one element is consistent with all—*motivation.* The ability of the instructor to maintain a high level of student participation and interest is essential to the student's future success in mastering Morse code.

Over the years I have put together a series of little tricks to make learning the code a little more fun. The first step is to access the academic and maturity levels of the students participating. Not all techniques will be successful at all levels, so modifications should be made as appropriate.

Get the students actively involved immediately. Once the code letters are practiced, let the students make up words or short sentences reflective of the code groups covered. The students will listen more intently, since they're waiting for the instructor to use *their* words.

Content of practice drills. Peer pressure is a valuable tool with students of school age, especially if it is used in a positive manner. By sending sentences to congratulate sports teams of their victories; individuals on their efforts and accomplishments; as well as reinforcing positive character statements; will be most effective.

Mix-up. Once all characters are taught, send interesting mixed groups. Items such as Star Wars' R2D2 and C3PO, and rock groups such as U2 are usually well received.

The fish bowl. Let the students compose words or select the characters by placing all of their suggestions in a container. When it is time for the instructor or student to send, let them select the words, phrases, or sentences previously submitted.

Contest time. Students like competion and once they master the fine art of Morse code, have a contest too see who is the best. This technique will only be effective if it is in a properly controlled environment. Using popular game shows, teams of individuals may compete in modified versions of Password™, Jeopardy™, College Bowl, or other high interest games.

Do this. The students have always liked this technique. Send a short sentence requesting the students to perform some type of physical act, such as "blink your left eye." Then all the instructor has to do is look around the room to see who copied the command. Begin with large motor activities, such as "stand up," then refine the act. Even seemingly silly things, such as "wiggle your ears" can be done without too much of an uproar. Once I asked the class to scratch their heads. One student didn't copy the instructions properly, and was a bit puzzled. He looked around and saw everyone else scratching, he responded by moving his chair away from his classmates. An alternative would be to play Simon Says, using SS to save time when issuing commands.

Did you hear the one about... Set up the class for a punchline. Begin a story or joke verbally and send the punchline in Morse code. This technique will also work with positive gossip, such as an upcoming dance or party.

Maximize time available. Give the students as much opportunity to send as possible. By so doing, they become more involved in the learning activity, since it requires the use of more learning modes, such as sight, sound, and touch.

Be creative. Give the students an opportunity to communicate via the Morse code using alternative means. Who says the only way to receive code is via a properly adjusted Code Practice Oscillator? Ever try sending code via a flashlight, blinking eyes, a bullhorn, trumpet, pen clicks, or pencil taps?

Code only day. Students must communicate with each other via Morse code, *no talking* allowed. Total immersion into the subject fosters a variety of creative abbreviations.

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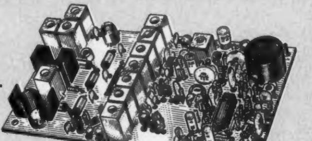

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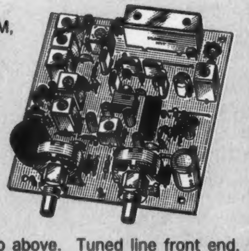

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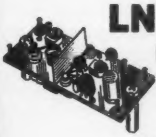

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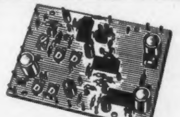

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220-224	50-54
222-224	28-30
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Briefly Speaking: Hornblower 2

Not just another DTMF decoder

by W. Max Adams W5PFG

The Reason

Hornblower does more than just blow horns. Originally, a DTMF coded system was conceived to allow remote control of household features, such as lighting, air conditioning and hot water heating. I wanted this because I was a field service representative who travelled with his wife away from home for up to eleven months at a time! There was the big worry that the house would be broken in to during our long absences!

"OM, why not build a Hornblower?" To my wife, OM means Old Monkey.

So off I set to do just that. Read on to find out about it.

The Original Hornblower

Hornblower One (HB-1) used a 12-volt SSI201 IC interfaced to Ma Bell wires. When called, the home phone would ring one time, then become silent. HB-1 needed to recieve some DTMF within five seconds before it hung up.

So, while at the airport on the way home, I drop a quarter and phone home, plus some HB-1 DTMF codes. Code A6024A turns a nice 25-watt/0.2µV, 200-foot DB-24 repeater on. Code B6025B turns it off. Code 6025 turns bedroom, bathroom and front porch lights on and rings the door bell once every 60-seconds. Code 6027 turns air cooling conditioning on, or, Code 6029 turns air warming conditioning on. Code 2406 resets it all to off. Later, within repeater range, several "fun-and-game" DTMF codes encourage unwanted intruders to not be home when CB (my wife) and I arrive.

Hornblower's range of uses is limited only by the user's imagination! HB-1 was massaged into Hornblower Two—a more advanced DTMF controller.

Hornblower Two

Hornblower Two consists of three basic modules: a DTMF/1-16 decoder, a Window Gate (WG), and a Coded Relay Latch (CRL).

DTMF codes are sequentially selected by pressing keypad switches (Figure 2), or selecting automatic programmable memory circuits. A four-digit DTMF code sequence uses the first three digits as device identification, and the fourth digit for the ON function. An OFF function requires the same three digits for device identification, and a different fourth digit to reset the associated device. Star (*) and pound (#) DTMF signals are not used for Hornblower codes. These are reserved for "open" autopatch use. Four-digit DTMF sequences provide 11,340 usable control codes. Two typical codes are:

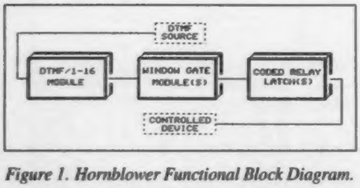


Figure 1. Hornblower Functional Block Diagram.

1234 Device ON, 1235 Device OFF

Repeating digits, such as 1123, 1223, 1222, etc., will work, but the repeated digit "falls through," reducing dialing security by a digit or more.

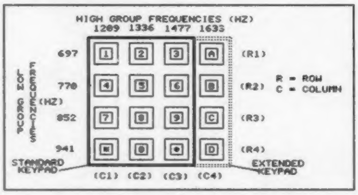


Figure 2. 4" x 4" Keypad DTMF Frequencies.

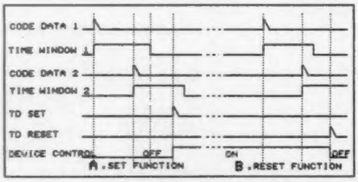


Figure 3. Hornblower Signal Flow Diagram.

Hornblower's DTMF/1-16 decoder module uses three integrated circuits: an SSI202 DTMF decoder, a CD4001 Strobe/Enable circuit and a CD4514 one-of-sixteen demultiplexer. See Figures 4 and 12. Radio receivers, telephone lines, and photo-optical systems can supply the audio frequency signals containing DTMF information. DTMF receiver, U101, uses a 3.57 MHz color-burst crystal to provide a stable reference "clock signal" for 101's decoding and logic timing circuits. U101 processes the incoming information, and, when DTMF signals are detected, logic (hexadecimal format) signals are applied to a four-line output bus circuit. Approximately 7 µs after data representing the received DTMF is present on U101's output bus, a logic high (1) signal appears as a DATA VALID (DV) output. DV triggers a one-shot circuit, which provides Enable (EN) and Strobe (STRB) logic signals to a one-of-sixteen demultiplexer. A sixteen line Tone Data (TD) bus includes logic high pulse representation of received DTMF 1 through 0, A, B, C, D, * and # data.

Hornblower uses two-input passive AND gates, which provide ENABLE (EN) and TONE DATA (TD) input to WG and CRL modules. (Active, two-input AND gate ICs could be used, however, because of single sided circuit board layout and "learning curve" considerations, I decided to use the "oldie but goodie" diode/resistor "wired AND" gate). The AND gate and NOR gate schematic symbols and truth tables, shown in Figures 5A and 5B, help clarify Hornblower's operation.

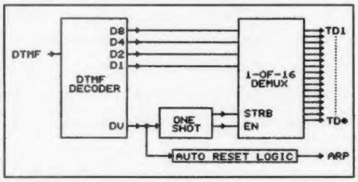
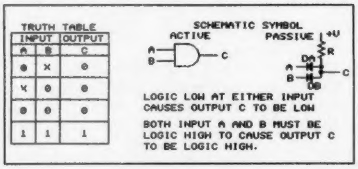


Figure 4. DTMF/1-16 Module Block Diagram



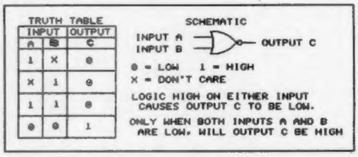
TRUTH TABLE

INPUT		OUTPUT
A	B	C
0	X	0
X	0	0
0	0	0
1	1	1

LOGIC LOW AT EITHER INPUT CAUSES OUTPUT C TO BE LOW

BOTH INPUT A AND B MUST BE LOGIC HIGH TO CAUSE OUTPUT C TO BE LOGIC HIGH.

Figure 5A. Two-Input AND Gate Schematic Symbols and Truth Table.



TRUTH TABLE

INPUT		OUTPUT
A	B	C
1	X	0
X	1	0
1	1	0
0	0	1

0 = LOW 1 = HIGH
X = DON'T CARE

LOGIC HIGH ON EITHER INPUT CAUSES OUTPUT C TO BE LOW.

ONLY WHEN BOTH INPUTS A AND B ARE LOW, WILL OUTPUT C BE HIGH

Figure 5B. Two-Input NOR Gate Schematic Symbols and Truth Table.

Low current, CMOS two-input NOR gates are used as conventional one-shot Window Gate (WG) and flip-flip-flop Coded Relay Latch (CRL) circuits.

Each WG includes a passive two-input AND gate and a 1-shot timing circuit. See Figure 6B. According to the truth table shown in Figure 5A, AND gate input A and input B must be logic high (1) for output C to be logic high. One input of a passive AND gate can be left disconnected, or "floating" to a logic high condition, which enables logic high activity on the remaining input. Likewise, one input of any AND gate may be either switched manually or logic controlled to enable logic activity on the other input. One AND gate input of Hornblower's first window gate is left floating, which enables the remaining input to accept the first Tone Data pulse of the DTMF code sequence.

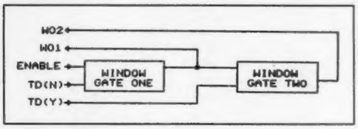

WO2
WO1
ENABLE
TD(N)
TD(Y)
WINDOW GATE ONE
WINDOW GATE TWO

Figure 6A. Dual Window Gate Block Diagram.

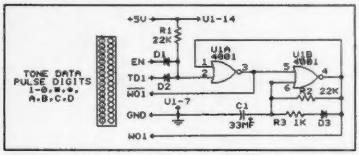

+5V
U1-14
R1 22K
U1A 4001
U1B 4001
EN
D1
TD1
D2
WO1
GND
U1-7
C1 33MF
R2 22K
R3 1K
D3
TONE DATA PULSE DIGITS 1-0,*,#, A,B,C,D

Figure 6B. Typical Dual Window Gate Module Schematic Diagram.

A logic high pulse applied to U1-2 (Figure 6B) causes a logic low (0) to U1-5. Previously U1-4, being logic low, discharged capacitor C1, causing U1-6 to be held logic low. According to the truth table shown in Figure 5B, logic high to U1-5, when U1-6 is logic low, causes U1-4 and U1-2 to become logic high. A logic high to U1-2 causes the circuit to "latch-up" and allows U1-4 to provide C1 a charge voltage source at a rate controlled by R2. C1 continues charging until U1B's logic high threshold is reached; U1-4 (and U1-2) then change to logic low, restoring (resetting) WG to its original condition.

Capacitor C1 discharges through resistor R2, when U1-4 is logic low, at approximately the same rate used during its charging interval. Should quicker circuit recovery time be desired, R2 may be parallel connected with resistor R3 and diode D3. This reduces circuit resistance from that of R2 to approximately that of R3, thereby discharging C1 at a faster rate.

Window Output 1 (WO1) becomes logic high, during C1's charging interval, enabling the circuit to accept the next TD pulse input. A TD pulse input to the second window gate, after completion of the enabling WO period, will not initiate the second WG. Likewise, when the correct TD pulse arrives during the first WG enabling interval, the second WG becomes active, providing an enable to the next circuit.

The user can connect several WGs "in series." Each WG adds an additional code digit, thereby increasing dialing security and total number of usable codes. The last WG enables a Coded Relay Latch circuit (CRL), shown in Figure 7A.

Two passive AND gates and one 2-input NOR gate are used for each Coded Relay Latch (CRL) circuit. See Figure 7B. A single WG logic high (WO) output enables (EN) each AND gate.

A Tone Data Set (TDS) pulse applied to D1 causes U1C-9 (Figure 7B) to become momentarily high. According to the NOR Gate logic table (Figure 5B), when U1C-8 is low, U1C-10, and U1D-13, through resistor R6, becomes low when the TDS pulse occurs. U1D-12 is held logic low (via D4's circuit) due to no TDR pulse at this time and therefore U1D's output (U1D-11) and U1C-8, through resistor R7, becomes high, "flipping" the latch circuit ON.

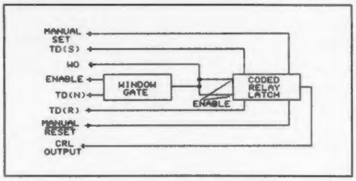

MANUAL SET
TD(S)
WO
ENABLE
TD(N)
TD(R)
MANUAL RESET
CRL OUTPUT
WINDOW GATE
CODED RELAY LATCH
ENABLE

Figure 7A. WG/CRL Block Diagram.

The base of transistor Q1 is forward-biased when U1D-11 becomes high, causing its collector-to-emitter (C-E) circuit to saturate. Low (saturated) resistance of Q1's C-E causes relay K1 to energize, thereby switching K1's common (C) contact from Normally Closed (NC) to Normally Open (NO).

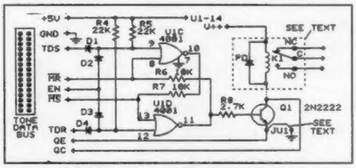
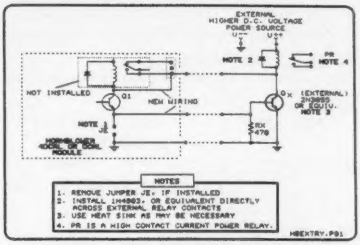

+5V
R4 22K
R5 22K
U1C 4001
U1-14
U++
SEE TEXT
GND
D1
TDS
D2
MR
EN
MS
D3
D4
TDR
QE
QC
R6 10K
R7 10K
U1D 4001
R8 2.7K
Q1
2N2222
JU1
SEE TEXT
PD
K1
NC
C
NO
TONE DATA BUS

Figure 7B. CRL Schematic Diagram.

Q1's collector and emitter connections (with jumper JU1 removed) are wired to card edge connections QC and QE, respectively. This allows Q1 to be connected to a larger, high current transistor in what is known as a Darlington Pair. See Figure 7C. The use of a higher current switching transistor permits control of larger relays, which require greater mechanical power to operate their contacts.

PD becomes forward-biased when Q1 (and/or its associated high power external transistor) is switched OFF, thereby shunting a high voltage spike created by K1's collapsing magnetic field. Protective diode PD, when used with external relays, should be located at (directly across) the external relay's coil.

System wiring (Figure 8) and all other components used for my prototype Hornblower Two are mounted in a 2 x 3 x 5-½ inch aluminum enclosure. 10–15 VDC power operates K501 and IC501, a 5 VDC regulator, which provides power to a DTMF/1-16 decoder module and a 4-digit Coded Relay Latch module. The internal (or external) speaker is connected directly to the DTMF source, when power switch S501 is OFF. R502, a ½-watt resistor, serves as an audio source dummy load when Hornblower (HB) operation is selected and the unit is inactive. Relay K501 is energized by a single transistor (Q1) located on the CRL module. One section of K501 switches the audio source, from R502, to the speaker circuit, when the unit is active, allowing source audio monitoring AUTO RESET is used to prevent Hornblower resetting and continuous "horn blowing." CRL Manual Set (MS) and Manual Reset (MR) panel switches provide local control of each device, without use of DTMF codes.


EXTERNAL HIGHER D.C. VOLTAGE POWER SOURCE
V--
V++
NOTE 2
PR NOTE 4
NOT INSTALLED
Q1
NEW WIRING
QX (EXTERNAL) 2N3055 OR EQUIV. NOTE 3
NOTE 1
JE
RX 470
HORNBLOWER 4DCRL OR DCRL MODULE
HBEXTRY.P01

NOTES
1. REMOVE JUMPER JE, IF INSTALLED
2. INSTALL 1N4003, OR EQUIVALENT DIRECTLY ACROSS EXTERNAL RELAY CONTACTS
3. USE HEAT SINK AS MAY BE NECESSARY
4. PR IS A HIGH CONTACT CURRENT POWER RELAY.

Figure 7C. Power Relay Wiring Diagram.

Additional control functions can be added to one DTMF/1-16 decoder module and each WG output may be connected to several WG and/or CRL modules. The first WG enable (EN) input is left "floating" (logic HIGH) for normal dialing code operation, or may be switched to ground, thereby disabling all associated (subsequent) functions.

Hornblower code coordination should be developed for each geographical area. Dialing security is enhanced by use of "dummy" digits, or extra digits provided by additional window gates. 11,340 unique four-digit codes are available—adequate for most areas. I suggest the following system for assigning four digit codes:

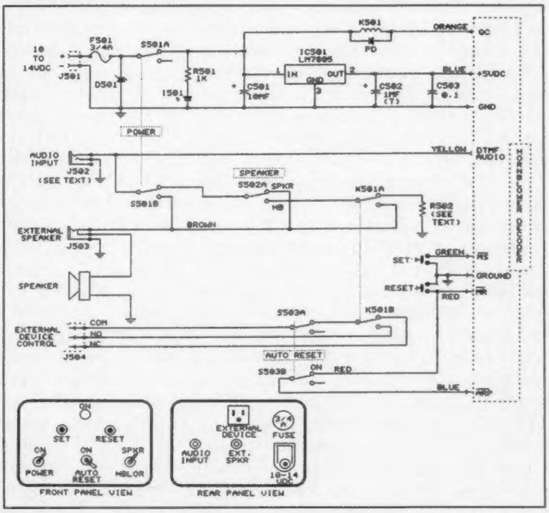

10 TO 14VDC
J501
F501 3/4A
D501
S501A
R501 1K
I501
K501
PD
IC501 LM7805
IN
GND
OUT
C501 10MF
C502 1MF (T)
C503 0.1
ORANGE
QC
BLUE
+5VDC
GND
POWER
AUDIO INPUT
J502 (SEE TEXT)
YELLOW
DTMF AUDIO
SPEAKER
S502A SPKR
HB
S501B
K501A
R502 (SEE TEXT)
BROWN
EXTERNAL SPEAKER
J503
SPEAKER
SET
GREEN
MS
GROUND
RESET
RED
MR
S503A
K501B
EXTERNAL DEVICE CONTROL
COM
NO
NC
J504
AUTO RESET
S503B
ON
RED
BLUE
HORNBLOWER DECODER
ON
SET
RESET
ON POWER
ON AUTO RESET
SPKR HBLOR
FRONT PANEL VIEW
EXTERNAL DEVICE
3/4 A FUSE
AUDIO INPUT
EXT. SPKR
10-14 VDC
REAR PANEL VIEW

Figure 8. Hornblower system wiring diagram.

Breakdown of Hornblower Code 1234:

First digit = Number One of ten geographical areas.
Second digit = Second of nine groups in area 1000.
Third digit = Third of nine individuals in group 2, area 1000.
Fourth digit = Fourth of nine functions, 3rd individual in group 2, area 1000.

Figure 9 shows a Hornblower system with an added WG and CRL. The code example above is expanded by the use of DTMF A, B, C or D (TD4) and one additional 1 through 0 DTMF digit. In this configuration, for example, 123A4 sets CRL 2 On, and 123A5 sets CRL 2 OFF.

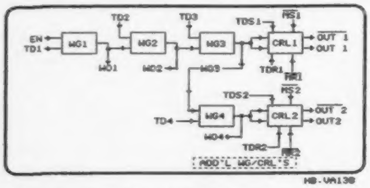


Figure 9. Two-function Hornblower Block Diagram.

DC power required for Hornblower operation is dependent on the total number of Hornblower modules and relays used in an individual system. See Table 1.

DC Supply Voltage (VDC)	9.0	12.0	13.6
DTMF/1-16			
Decoder Module	19.0	22.0	23.6 mA
4-Digit Coded Relay Latch	0.1	0.1	0.1 mA
Relay (12 VDC, 250Ω Coil)	27.0	43.6	49.2 mA

Table 1. Hornblower Power Requirements.

Hornblower module construction is not critical. Since the highest frequency used is 1633 Hz (except for the 3.57 MHz colorburst crystal), component part layout using wire-wrap, perf-board or etched printed wiring is OK. Resistor and capacitor values may be altered to suit individual requirements. For example, longer RC time constants provide longer window enabling, which allows slower dialing intervals, without effecting higher speed, automatic (memory) dialing. Short time constants can be used to allow automatic dialing and restrict manual dialing. Restriction of manual dialing increases the difficulty of "Keypad Charley's" invasion of critical control systems.

Since the DTMF/1-16 decoder module is common to all other modules, complete this first. Don't apply audio frequency signals or receiver noise to the decoder module before DC power to keep U101 from harm.

Two points before continuing to the testing procedure. The following was omitted from the printed circuit board layout. TDA, TDB, TDC, TDS, and TDR are short flexible connections to TDP for code sequence selection. I used right-angle "berg" pins connected to color-coded #30 wire-wrap wire. Use heat shrink tubing on each pin to isolate adjacent connections.

Refer to the 4D CRL foil layout in Figure 10. The builder must connect a wire from the collector of Q1 to the blank space of the card-edge connector (after the fourth card edge trace from the left). This allows connection of external relays, LEDs, etc.

System Test

Make sure to test each module individually. Hand-draw a diagram using only the completed module as a reference, and then compare it to the original schematic to insure correctness of circuit wiring and component installation. Make sure that DC voltage cir- cuits are properly isolated and of correct polarity.

Wear a grounded wrist strap when handling CMOS chips to avoid damaging their delicate circuitry from static discharge.

Testing of a Hornblower system requires a DTMF source and a VOM. I used an IC-2AT with a dummy RF load and a short patch cord from the earphone jack to Hornblower. The user can hear the keypad DTMF as each digit is dialed, making it easier to observe voltmeter indications. Refer to the block diagram of the system (Figure 1) for clarification.

Again, don't apply audio frequency signals or receiver noise to the decoder module before DC power so as not to damage U101.

Install a jumper at AR1, AR2, or AR1 and AR2 to select the desired AUTO-RESET timing interval.

Connect the test DTMF source and apply power to the Hornblower system, then apply power to the test source. Observe the voltmeter indications listed below.

Voltmeter indications on the DTMF Decoder (DTMF/1-16) module:

1. +5 VDC on U101 pins 2, 3, 5, and 8.
2. +5 VDC on U102 pins 14 and 11.
3. +5 VDC on U103 pins 24 and 23.
4. +5 VDC on U101 pin 14, when transmitter is keyed ON and any DTMF key is pressed.
5. +5 VDC on U103 pins 2, 3, 21, and 22 when transmitter is keyed and an associated DTMF key is pressed.
6. Observe momentary positive voltage indication on each Tone Data output from U103, when transmitter is keyed and an associated DTMF key is pressed.
7. Connect voltmeter to U102 pin 10. Observe time of day (minutes and seconds) when transmitter is keyed and any DTMF key is pressed and measure duration of auto-reset voltage.

Pin Number	DTMF/1-16	DCRL	4DCRL	4WG
1	+5 VDC	+5 VDC	+5 VDC	+5 VDC
2	Ground	Ground	Ground	Ground
3	Audio Input	Not Used	RY Common	Not Used
4	ARP	Not Used	RY NO/NC	Not Used
5	Not Used	Not Used	Not Used	Not Used
6	Not Used	Not Used	WOA	Not Used
7	Not Used	QB	WOB	WOA
8	Not Used	MSB	ENB	ENA
9	Not Used	MRB	ENA	ENB
10	Not Used	ENB	WOC	WOB
11	Not Used	ENA	ENC	ENC
12	Not Used	QA	LEN	END
13	Not Used	MSA	MS	WOC
14	Not Used	MRA	MR	WOD
15	TD1	TD1	TD1	TD1
16	TD2	TD2	TD2	TD2
17	TD3	TD3	TD3	TD3
18	TD4	TD4	TD4	TD4
19	TD5	TD5	TD5	TD5
20	TD6	TD6	TD6	TD6
21	TD7	TD7	TD7	TD7
22	TD8	TD8	TD8	TD8
23	TD9	TD9	TD9	TD9
24	TD0	TD0	TD0	TD0
25	TDA	TDA	TDA	TDA
26	TDB	TDB	TDB	TDB
27	TDC	TDC	TDC	TDC
28	TDD	TDD	TDD	TDD
29	TD*	TD*	TD*	TD*
30	TD#	TD#	TD#	TD#

Coding for the above table:
DCRL - Dual Coded Relay Latch
4DCRL - 4-digit Coded Relay Latch
RY - Relay
NO/NC - Normally Open/Normally Closed
WO(A–D), - Window Open (A–D)
MS(A), (B) - Manual Set (A), (B)
TD - Tone Data
Q (A), (B) - Transistor (A), (B)
EN(A–D) - Enable (A–D)

Table 2. Hornblower Board Pin-Out.

8. If it's hard to see the the tone data pulses from the DTMF/1-16 Module, *temporarily* connect a 10μF capacitor across C-104. Observe capacitor polarity—positive terminal to U102B, pin six. This causes the Tone Data pulses (TD1 to TD#) to dwell longer, allowing easier measurement with VOMs and DVOMs.

4DCRL Module Test

Use these procedures to test the four-digit Coded Relay Latch:

1a. Install 4DCRL module on suitable motherboard, interfaced to DTMF/1-16 module. See Figure 11. The configuration in Figure 11 will turn on a speaker (code 1234), reset (1235), send an all call for geographic area 1 (1A), and send all group 2 in geographic area 1 (12B).

1b. Place HB/SPKR switch in HB position.

1c. Place AUTO-RESET switch OFF.

Connect the test DTMF source and apply power to the Hornblower system. Then, apply power to the test source (see Figure 11). Observe the following voltmeter indications:

1. +5 VDC on U1 pins 3, 11 and 14.
2. Operate Manual Reset (MR) push switch momentarily.
3. +5 VDC on U2 pins 3, 9, 11 and 14.
4. Power supply unregulated (DC source) voltage on Q1 collector.
5. Zero volts on Q1 Emitter.
6. Zero volts on U1 pins 4 and 10.
7. Zero volts on U2 pins 4, 8 and 13.
8. Connect voltmeter to U1 pin 4. Observe time of day (minutes and seconds), when transmitter is keyed and the DTMF key associated with this WG's TD selection is pressed. Measure the duration of window gate output (WOA) +5VDC voltage.

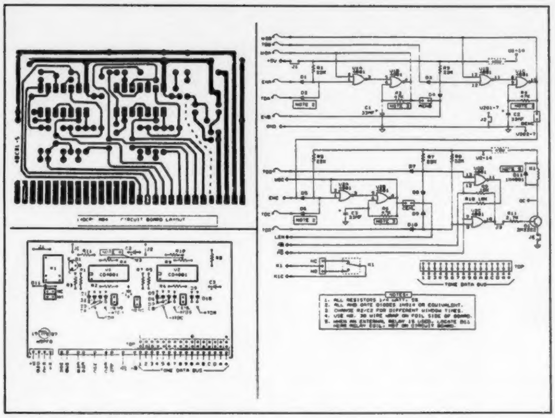


Figure 10. Four digit CRL foil pattern and schematic. Edge pins are on 0.2" centers.

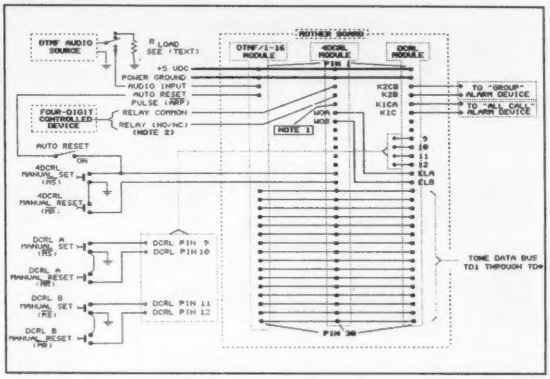

DTMF AUDIO SOURCE
R LOAD SEE (TEXT)
MOTHER BOARD
DTMF/1-16 MODULE
4DCRL MODULE
DCRL MODULE
PIN 1
+5 VDC
POWER GROUND
AUDIO INPUT
AUTO RESET PULSE (ARP)
FOUR-DIGIT CONTROLLED DEVICE
RELAY COMMON
RELAY (NO/NC) (NOTE 2)
NOTE 1
WOA
WOB
K2CB
K2B
K1CA
K1C
TO "GROUP" ALARM DEVICE
TO "ALL CALL" ALARM DEVICE
9
10
11
12
ELA
ELB
AUTO RESET
ON
4DCRL MANUAL SET (MS)
4DCRL MANUAL RESET (MR)
DCRL A MANUAL SET (MS)
DCRL A MANUAL RESET (MR)
DCRL B MANUAL SET (MS)
DCRL B MANUAL RESET (MR)
DCRL PIN 9
DCRL PIN 10
DCRL PIN 11
DCRL PIN 12
TONE DATA BUS TD1 THROUGH TD8
PIN 30

Figure 11. Hornblower Two Motherboard.

9. Install push-on jumper at AENB. NOTE: Turn power OFF prior to installing soldered-in jumper. Turn power ON to continue testing after AENB jumper is installed.
10. Connect voltmeter to U1 pin 10. Observe time of day (minutes and seconds) when transmitter is keyed and the DTMF key associated with *the previous WG and this WG's TD* selection is pressed. Again, measure the duration of window gate output (WOB) +5 VDC voltage.
11. Install push-on jumper at BENC. NOTE: Turn power OFF prior to installing soldered-in jumper. Turn power ON to continue testing after BENC jumper is installed.
12. Connect voltmeter to U2 pin 4. Observe time of day (minutes and seconds), when transmitter is keyed and the DTMF key associated with *the previous WG's and this WG's TD* selection is pressed. Measure the duration of window gate output (WOC) +5VDC voltage.
13. Install push-on jumper at CENL. NOTE: Turn power OFF prior to installing soldered-in jumper. Turn power ON to continue testing after CENL jumper is installed.
14. Connect voltmeter to Q1 collector. Observe power supply (DC source) voltage, dropping to NEAR ZERO VDC when transmitter is keyed and selected DTMF "ON" code is dialed. Use #30 wire-wrap wire and "white-wire" (patch) the collector of Q1 (CRL circuit) to the card edge. This allows use of an external relay with multiple, high-current "dry" contacts and/or an LED indicator to show latch circuit "SET" conditions.
15. Connect voltmeter to Q1 collector. Observe NEAR ZERO VDC, abruptly increasing to power supply (DC source) voltage, when transmitter is keyed and selected DTMF "OFF" code is dialed.
16. Place AUTO-RESET switch ON.
17. Set ohmmeter to a low resistance range. Connect ohmmeter to external device connector. Observe time of day (minutes and seconds), when transmitter is keyed and selected DTMF "ON" code is dialed.
18. Measure duration of AUTO-RESET interval, shown by change of ohmmeter resistance indication.

This ends the system testing procedure.

Uh, Oh!

There are a few corrective steps the builder must perform before operating the unit.

Find Figure 12 and locate the circuit board foil pattern for the decoder module (upper left). Scrutiny soon tells the reader that U102 pins 2,4 and 3,5 traces are reversed from that shown in the schematic. Use the following procedure to correct the circuit board wiring.

Locate U102 on the foil pattern. It is the 14-pin IC between the other two ICs. Near the trace junction of U102 pins 2 and 4, cut ⅛" from the foil trace connection between this junction and U103 pin 23. Leave the trace connection between U102 pins 2 and 4.

Continued on page 67

Parts List

Component tolerances for all Hornblower modules aren't critical. I chose commonly-available components. I suggest, however, that the builder choose parts with their physical dimensions in mind, so that they fit easily in their circuit board layouts. This simplifies construction and produces a more attractive finished module.

DTMF/1-16 Decoder Module

Capacitors

C101	0.01 µF disk
C105B	150 µF, 16 VDC electrolytic.
C102(*)	0.1 disk
C106(*)	10 µF, 16 VDC electrolytic.
C103	0.1 µF disk
C107(*)	0.1 µF disk
C104	0.1 µF disk
C108	0.1 µF disk
C105A	50 µF, 16 VDC electrolytic.
C109	0.1 µF disk

(*)Include these items when module is used with long power leads or unit is installed in a high RF environment.

Resistors (¼ watt, 5%)

R101	10 MΩ
R104	220 kΩ
R102	22 kΩ
R105	10 kΩ
R103	10 kΩ

Crystal

3.579545 MHz (Color Burst)

Sockets/Jumper Pins/Edge Connectors

IC101	18 pin, 0.3" spacing 20-edge connector, 90 degree male.
IC102	14 pin, 0.3" spacing 4-post connector, C/B Mtg., with push-on jumpers.
IC103	24 pin, 0.6" spacing

Transistor/Integrated Circuits

U101	SSI202, DTMF Receiver
U102	CD4001, CMOS 2-input NOR Q1 2N222 NPN, or equivalent 4-Digit Coded Relay Latch Module
U103	CD4514 1-of-16 decoder

Capacitors

C1, C2, C3	33 µF, 16 VDC Electrolytic

Resistors (¼ Watt, 5%)

R1, R3, R9, R10	10 kΩ
R5, R7	22 kΩ
R11	2.7 kΩ
R2, R4, R6	47 kΩ

Diodes

D1–D10	1N914 or equivalent.
D11	1N4001 or equivalent.

Sockets/Jumper Pins/Edge Connectors

IC1, IC2 Socket, 14 pin, 0.3" pin (row) spacing
29 edge connector, 90 deg. male.
10 post Connector, C/B Mtg. Male, TDP Connector, 32-Pin Female with 4 each push-on jumpers.

Relay

K1	5 VDC coil, with Form 1C (SPDT) contacts, 0.3" pin (row) spacing.

Components for the Hornblower are available from The Circuit Board Shop, PO Box 831555, Richardson TX 76083. These prices include shipping and handling:

4WG and DCRL boards—$7.00 each
DTMF/1-16 and 4DCRL boards—$11.95 each

73 Review *reviewed by Bill Clarke WA4BLC*

Datong's Great Add-On Filters

Super audio accessories

Datong Products
Price of FL3: $229.95
Price of FL2: $159.95
Price of ANF: $119.95

> ***Happy are they that hear their detractions and can put them to mending.* —*Shakespeare***

When I first received the Datong audio filters for review I thought, "Uh huh, more audio filters, just what the world really needs!" Well, I was wrong for thinking such negative thoughts. The Datong filters are just what the world needs.

For my primary operations I use a Kenwood TS-430 and ICOM 751A. The backup rig is a Drake TR3. Don't laugh! That old tube burner can still hear with the best of them, talk with the best of them, and I can fix it when it breaks, unlike the best of them. But, here lies the problem–it doesn't select with the best of them.

Operating in a crowded band is where the Datong audio filters shine. Like most older tube rigs, the Drake lacks top dollar receiver selectivity and the all important notch filter. . . the device that gets rid of the carriers produced by tuner-uppers and foreign broadcasts. I won't even mention what happens in certain parts of the seventy-five meter band where some AM is still spoken.

Now, by using the Datong audio filter, I can make the Drake sound as good as the best of them. In fact, with something only the Datong filter offers, I can make it better. More on that later.

Descriptions

The Datong filters come in three makes. The most complete is the FL3, followed by the FL2 and the ANF.

The FL3 offers a notch/peak filter, variable low cut-off filter, variable high cut-off filter, and an automatic notch filter.

The FL2 has the same line up of features as the FL3, except the automatic notch filter is not included.

The ANF is an automatic notch/peak filter with LED tracking.

The ANF is in a smaller box than the FL series filters.

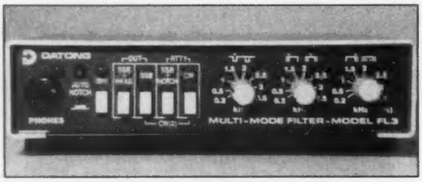


Photo A. The FL3 is full featured to provide complete control of received audio.

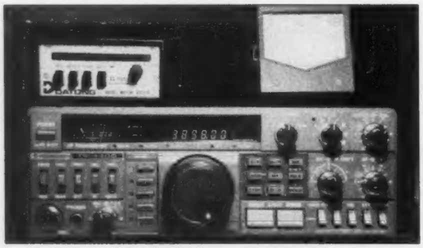


Photo B. Notice the 10 segment LED bar graph at the top of the ANF for displaying search and lock action.

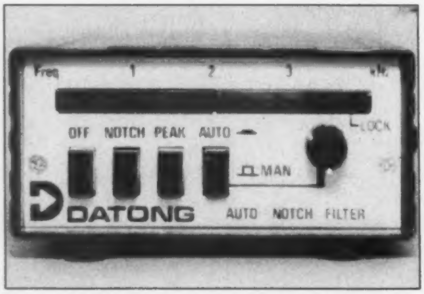


Photo C. The ANF is the best "black box" I have seen in a very long time. I strongly recommend it.

Features

The secret to a good receiver is selectivity. The better the selectivity, the better the receiver. A filter with very steep skirts is required for razor sharp selectivity. Using 5 pole computer optimized elliptic function filters, Datong provides just such filters.

The FL3 provides two filters, each with skirts that are movable from 200 to 3500 Hz. One filter is used for low cut-off and the other for high cut-off. Each filter section is independently voltage controlled. There is also a two-pole notch filter that can double as a peak filter. These filters can provide received audio equal to, or surpassing, that attainable from receivers having IF shift or Pass Band Tuning.

The automatic notch filter is perhaps the best feature of the FL3 (it's not found on the FL2). At the mere push of a button, any single steady tone that appears on the received signal is notched out. Now, let's try that again–is automatically notched out. The operator doesn't have to fiddle around with an overly sensitive notch filter control. The filter unit itself will do all the work.

Installation

The FL3 is almost as simple to hook-up as an external speaker. Just supply 12 VDC to the back panel, plug in an external speaker, and run a patch cord from the receiver's audio output to the filter input. This takes about two minutes. Other Datong filters install in a similar manner.

Operation

Before reading about my operational experiences with the Datong filters, please understand that I enjoy top quality audio. Anything less is not enjoyed (allowed) in my shack. To this end I have

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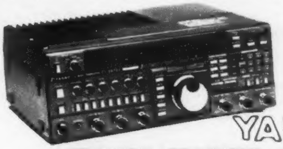

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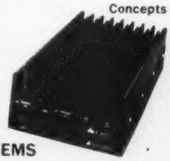

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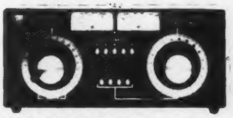

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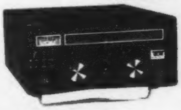

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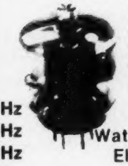

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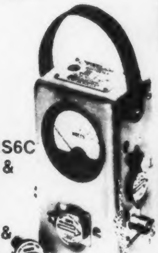

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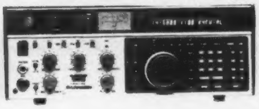

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used various external speakers, have tried many kinds of filters, and attempted a little voodoo. I even have an audio equalizer.

I did most of my testing on the seventy five meter phone band in the early evening hours. I feel this is the place that puts receiver selectivity to task as nothing else can.

The old Drake came out like gang busters. I was able to get on all my usual nets and listen for hours with virtually no interference. I used the high cut-off and low cut-off variables to create a narrow SSB filter effect, thereby eliminating the abundant squeaks and squawks that normally plague seventy five meters.

While I was listening, I selected various speakers and switched between the Drake, the 430, and the 751A. The results were amazing. The TR3 breathed with new life. The FL3's controls gave me the necessary receiver flexibility, similar to using the 430's IF shift and 1.8 kHz filter or the Pass Band Tuning and tone control on the 751A, to clean up the TR3's received signals. In most cases I found my receive audio much the same on all three receivers.

Notch filter action is good, very deep and quite sharp, yet typically difficult to tune (most are). Ah, however, there is the automatic notch filter. Its action is truly extraordinary.

In the past, when a tuner upper appeared on frequency, I had to reach for the notch control and slowly turn it until the offending whistle disappeared. Often it went away by itself before I could tune it away. Now, by merely turning on the automatic notch filter, the offensive signals disappear by themselves. No effort to me.

The automatic notch filter operates by continuously sweeping the 200 to 3500 Hz band searching for tones. When it finds one, it locks on it, then notches it out. The typical lock on time is less than a second. Not only is the acquisition speed of the automatic notch impressive; so is the depth of the notch. It took out every carrier I heard.

At first I wasn't sure the automatic notch was working. True, I was hearing no carriers, and the LED indicated lock on. But I didn't know for sure. By turning the filter on and off I confirmed that the filter was indeed doing its work. The manual notch can be used in conjunction with the automatic notch, allowing the elimination of two simultaneous unwanted signals.

I should mention this: Don't forget to turn the automatic notch filter off when operating CW or RTTY. It will effectively notch out the desired signals as quickly as it does away with offensive ones. It's automatic, not smart!

The FL3 has a CW mode that combines the low and high pass filters with the peak filter. The result is an excellent skirt effect with a peaked response. The peak frequency is easily tunable and the bandwidth is continuously variable from 100 to 1750 Hz. The filters provide a pleasing CW note, with no ringing. Ringing has plagued many audio filters, making them unpleasant, uncomfortable, or totally unusable.

> ***"Uh huh, more audio filters, just what the world really needs!"***

I also tested the ANF (Automatic Notch Filter). This unit is a stand alone notch filter providing manual and/or automatic notch and peak functions. It works as well as the notch filter found in the FL3 and provides a visual tracking of tone searching.

For CW usage put the ANF in PEAK mode. The unit will then peak desired signals just as effectively as the notch locks them out. Operating within the automatic peak mode, I found it was not very effective. The unit is so fast in seeking out signals that it jumps around between CW characters. It's best to tune for peak with the manual control. I did find this control quite sensitive, but remember, the filter is only 60 Hz wide in the peak mode.

Although the following is a small point, I feel it is worth mentioning. The ANF unit is very light-weight, and when set on top of a receiver it might be expected it to slip and slide around. Not so! The little box has small foam feet that hang on like glue.

Recommendation

I tested and used the FL3 and ANF for several weeks before writing this article. I am impressed with both. They do everything they are supposed to, yet don't appear to have any bad habits. I really cannot say enough good about the automatic notch filter.

I have tested other audio filters in the past, was not pleased with them, therefore never wrote product reviews about them.

Would I recommend the Datong filters? Sure do! In fact, I have mine in the main station speaker line, where it can be switched to any rig by the turn of a knob. It's an adjunct to all my rigs, not just the old Drake.

I think the ANF is a "must have" item for any shack. It sits quietly while it works and needs no attention except to turn it on or off. Considering the investment most of us have in our stations, I think the price of the ANF is quite modest.

The FL3 is the ideal match up for an older radio (Drake, Collins, Swan, National, Heathkit, etc.). It updates them into the modern world of high selectivity. The cost of an FL3 is considerably less than that of a new solid state transceiver.

I must note that I really didn't realize that the technology of audio filtering had progressed to the point where Datong has brought it. I think that the manufacturers of amateur/SWL receivers should take note of these fine products, in particular the Automatic Notch Filter.

Specifications

FL3

Input impedance: 5000 Ω
Nominal overall gain: unity
Filters: Low cut-off
High cut-off
Notch/peak
Automatic notch
Low and high pass filter frequency range: 200 to 3500 Hz
Minimum stop band rejection: 40 dBs
Rate cut off: 40 dBs in 500 Hz at 2 kHz
40 dBs in 120 Hz at 500 kHz
Notch and peak filter frequency range: 200 to 3500 Hz
Notch width: 200 Hz
Notch depth: 30 dBs
RTTY bandwidth: 100 to 1750 Hz at -6 dBs
CW bandwidth: 70 to 700 Hz at -6 dBs
Power output: max 2 watts
Power requirements: 10 to 20 VDC at 50 to 350 mA
Dimensions: 7.2 x 6.0 x 1.7"
Weight: 39 oz.
Accessories: comes with patch cords.

ANF

Input impedance: 100kΩ
Nominal overall gain: unity
Filter: 2 pole (Q of 30)
Notch and peak filter frequency range: 270 to 3500 Hz
Notch width: 200 Hz
Notch depth: 40 dBs
CW bandwidth: 60 Hz at -3 dBs (800 Hz)
Power output: max 2 watts
Power requirements: 11 to 18 VDC at 75 to 400 mA
Dimensions: 5.9 x 3.5 x 1.7" Weight: 17 oz.
Accessories: comes with patch cords.

Datong filters and other products are available from:

Gilfer Shortwave
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The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 580XLT-SA** is a similar version without the 800 MHz. band for only $219.95.

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The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 20 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-SA3** for only $199.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

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List price $549.95/**CE price $259.95/SPECIAL**

12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC

Bands: 29-54, 118-174, 406-512, 806-912 MHz.

The *Bearcat* 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-SA** is available for $196.95.

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10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC

Bands: 29-54, 136-174, 406-512 MHz.

The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC 560XLT-SA** is available for $98.95. from Communications Electronics Inc.

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Frequency coverage: 35-54, 136-174, 406-512 MHz.

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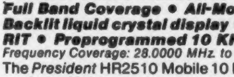

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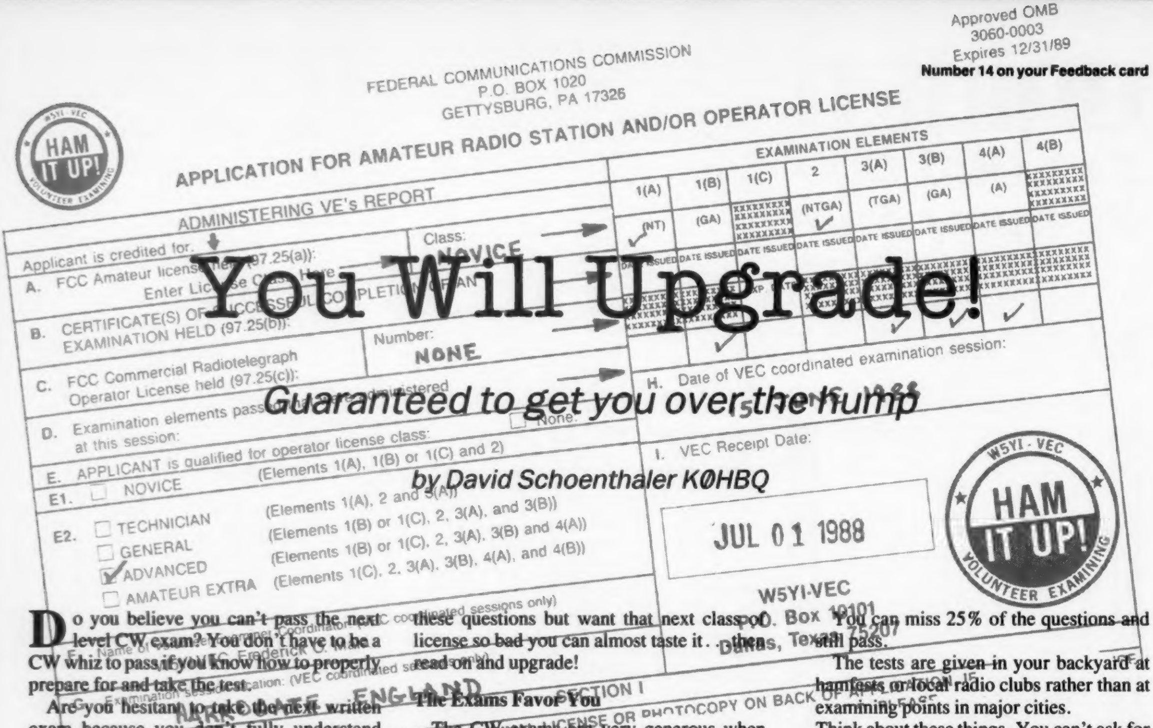
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ADMINISTERING VE's REPORT

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1(A) 1(B) 1(C) 2 3(A) 3(B) 4(A) 4(B)
(NT) (GA) (NTGA) (TGA) (GA) (A)
DATE ISSUED

Applicant is credited for: Class: NOVICE
A. FCC Amateur license ... (97.25(a)): Enter License Class Here
B. CERTIFICATE(S) OF SUCCESSFUL COMPLETION OF AN EXAMINATION HELD (97.25(b)):
C. FCC Commercial Radiotelegraph Operator License held (97.25(c)): Number: NONE
D. Examination elements passed that were administered at this session: ☐ None:
E. APPLICANT is qualified for operator license class:
E1. ☐ NOVICE (Elements 1(A), 1(B) or 1(C) and 2)
E2. ☐ TECHNICIAN (Elements 1(A), 2 and 3(A))
☐ GENERAL (Elements 1(B) or 1(C), 2, 3(A), and 3(B))
☑ ADVANCED (Elements 1(B) or 1(C), 2, 3(A), 3(B) and 4(A))
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You Will Upgrade!

Guaranteed to get you over the hump

by David Schoenthaler K0HBQ

Do you believe you can't pass the next level CW exam? You don't have to be a CW whiz to pass if you know how to properly prepare for and take the test.

Are you hesitant to take the next written exam because you don't fully understand the theory or because some of the formulas and schematics have you confused? The secret of passing any of the written exams is *knowing how to correctly answer the questions you don't fully understand*. You can do just that!

Have you failed the test a few times and now find yourself afraid to retake it for fear of failing again or perhaps thinking that it would be embarassing?

If you answered affirmatively to any of these questions but want that next class of license so bad you can almost taste it . . . then read on and upgrade!

The Exams Favor You

The CW exams are very generous when you consider examinees are not required to copy letter perfect for any length of time at all, and need only to correctly answer seven of the ten questions. This is more than fair. Why wait for a no-code license or settle for your current privileges when you *can* pass the next code test?

The FCC has gone about as far as it can go to make the written exams within the reach of practically everyone. Stop for a moment and consider:

The *exact* questions and *exact* answers are available as a study guide (totally unbelievable).

You can take the tests time and time again until you either pass, die or run out of #2 pencils, whichever comes first (almost unbelievable).

You get credit for test elements passed the next time you take the exam (unbelievable).

The tests are multiple choice rather than essay.

You can miss 25% of the questions and still pass.

The tests are given in your backyard at hamfests or local radio clubs rather than at examining points in major cities.

Think about these things. You can't ask for anything more. Their will always be a written test of some type, and we want that for the good of the hobby. Today's tests are designed to be passed... and you can do it.

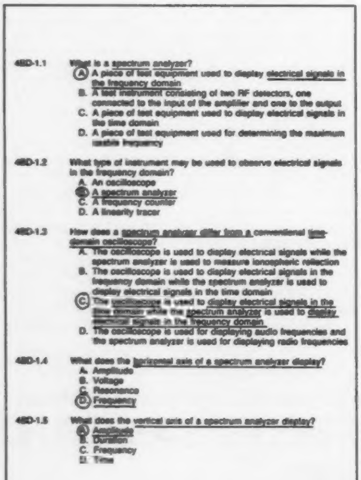
> **"The FCC has gone about as far as it can go to make the written exams within the reach of practically everyone."**

Just reading this magazine and enjoying ham radio at whatever level you are now at is, in my opinion, indicative that you have enough intelligence to pass your next level of exam. If you want to upgrade but are not willing to put forth the effort, there is nothing wrong with that. You can remain a shortwave listener or stay at your present level of license and enjoy ham radio within those limits. However, if you are willing to work at it and make up your mind to do it, you will in fact upgrade. Ham radio is fun at any level of license... but it's a whole new ball game when you have more privileges such as working the DX stations in the lower portion of the bands rather than just listening to them.

The choice is yours.

Preparing For The Exam

The number one rule in preparing for the code exam is a positive attitude. If you have trouble learning the code or increasing your speed, it probably is because of a bad attitude.


4BD-1.1 What is a spectrum analyzer?
Ⓐ A piece of test equipment used to display electrical signals in the frequency domain
B. A test instrument consisting of two RF detectors, one connected to the input of the amplifier and one to the output
C. A piece of test equipment used to display electrical signals in the time domain
D. A piece of test equipment used for determining the maximum usable frequency

4BD-1.2 What type of instrument may be used to observe electrical signals in the frequency domain?
A. An oscilloscope
Ⓑ A spectrum analyzer
C. A frequency counter
D. A linearity tracer

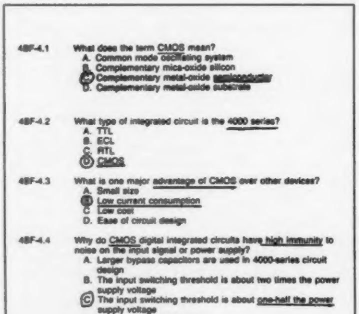
4BD-1.3 How does a spectrum analyzer differ from a conventional time-domain oscilloscope?
A. The oscilloscope is used to display electrical signals while the spectrum analyzer is used to measure ionospheric reflection
B. The oscilloscope is used to display electrical signals in the frequency domain while the spectrum analyzer is used to display electrical signals in the time domain
Ⓒ The oscilloscope is used to display electrical signals in the time domain while the spectrum analyzer is used to display electrical signals in the frequency domain
D. The oscilloscope is used for displaying audio frequencies and the spectrum analyzer is used for displaying radio frequencies

4BD-1.4 What does the horizontal axis of a spectrum analyzer display?
A. Amplitude
B. Voltage
C. Resonance
Ⓓ Frequency

4BD-1.5 What does the vertical axis of a spectrum analyzer display?
Ⓐ Amplitude
B. Duration
C. Frequency
D. Time

Spectrum Analyzer:
- electrical signals in freq. domain
- horiz. axis—frequency
- vert. axis—amplitude

Figure 1.


4BF-4.1 What does the term CMOS mean?
A. Common mode oscillating system
B. Complementary mica-oxide silicon
Ⓒ Complementary metal-oxide semiconductor
D. Complementary metal-oxide substrate

4BF-4.2 What type of integrated circuit is the 4000 series?
A. TTL
B. ECL
C. RTL
Ⓓ CMOS

4BF-4.3 What is one major advantage of CMOS over other devices?
A. Small size
Ⓑ Low current consumption
C. Low cost
D. Ease of circuit design

4BF-4.4 Why do CMOS digital integrated circuits have high immunity to noise on the input signal or power supply?
A. Larger bypass capacitors are used in 4000-series circuit design
B. The input switching threshold is about two times the power supply voltage
Ⓒ The input switching threshold is about one-half the power supply voltage
D. Input signals are stronger

Figure 2.

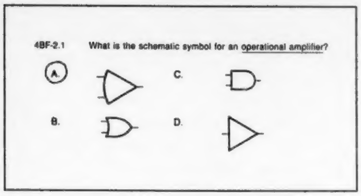

4BF-2.1 What is the schematic symbol for an operational amplifier?

Figure 3.

It is very common to hear all sorts of negative comments about code, and I made a lot of choice ones. I refused to work CW for approximately 25 years, but then decided to upgrade and changed my attitude. I viewed it as a challenge, bought a used keyer and realized all of a sudden I was having fun working CW.

Change your attitude right now and decide to master the challenge. You will cut out a lot of drudgery and will learn it in about half the time. Plus it's fun! 13 wpm is within the reach of practically everyone and this is all it takes for an Advanced ticket.

The second rule in order of importance is practice, practice, practice by listening, listening, listening. You want to pass the test, and it is a listening test. Listen to W1AW, on the air QSO's and practice tapes. Keep pushing your speed up by listening to speeds faster than you can copy 100%. Listen to speeds you can copy letter perfect to give you confidence. Practice at least a couple of times a day. On occasion practice with some distractions in the background, because most test sites are less than ideal.

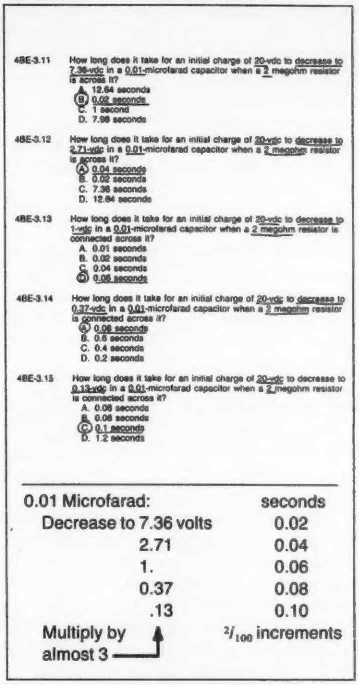
You also can get in a lot of practice without being at your operating desk. Whenever you have a few spare minutes—driving to work, waiting in line, on hold for a phone call, or anywhere else—look at an object or some printing and sound the characters out to yourself in code. Hear the words sent at various speeds. This is excellent practice and has been proven to be almost as effective as the real thing. Plus, it's fun.

Also make sure you get a copy of a Gordon West practice QSO tape for the level of exam you plan to take. These tapes follow the same format as the exam and are very helpful.

Avoid translating the letters you hear into visualized dits and dahs and then translating it to the actual letter. When you hear a di-dah you should immediately know it is an A. Do not add an intermediate step of visualizing the di-dah on paper. Translate once and once only or you won't make it to 13 wpm.

Learn to put a dash whenever you miss a letter. Do not dwell on letters you do not immediately know. Make a mark on your paper for *every* character you hear. By making a dash on the paper for characters you miss, you'll know exactly how many characters you have to fill in. Worrying over a missed character only guarantees you'll miss the next several.

Master the numbers and master them well. There will be at least two to three questions involving numbers on the exam. It's not good to be guessing numbers because you're either right or wrong.


4BE-3.11 How long does it take for an initial charge of 20-vdc to decrease to 7.36-vdc in a 0.01-microfarad capacitor when a 2 megohm resistor is across it?
A. 12.64 seconds
[✓ B.] 0.02 seconds
C. 1 second
D. 7.98 seconds

4BE-3.12 How long does it take for an initial charge of 20-vdc to decrease to 2.71-vdc in a 0.01-microfarad capacitor when a 2 megohm resistor is across it?
[✓ A.] 0.04 seconds
B. 0.02 seconds
C. 7.36 seconds
D. 12.64 seconds

4BE-3.13 How long does it take for an initial charge of 20-vdc to decrease to 1-vdc in a 0.01-microfarad capacitor when a 2 megohm resistor is connected across it?
A. 0.01 seconds
B. 0.02 seconds
C. 0.04 seconds
[✓ D.] 0.06 seconds

4BE-3.14 How long does it take for an initial charge of 20-vdc to decrease to 0.37-vdc in a 0.01-microfarad capacitor when a 2 megohm resistor is connected across it?
[✓ A.] 0.08 seconds
B. 0.6 seconds
C. 0.4 seconds
D. 0.2 seconds

4BE-3.15 How long does it take for an initial charge of 20-vdc to decrease to 0.13-vdc in a 0.01-microfarad capacitor when a 2 megohm resistor is connected across it?
A. 0.06 seconds
B. 0.08 seconds
[✓ C.] 0.1 seconds
D. 1.2 seconds

0.01 Microfarad:	seconds
Decrease to 7.36 volts	0.02
2.71	0.04
1.	0.06
0.37	0.08
.13	0.10
Multiply by almost 3 ↑	$^2/_{100}$ increments

Figure 4.

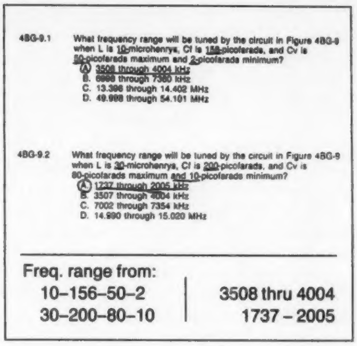
Get on the air and operate CW once in a while for a change of pace. You might even have sweaty palms but that is normal. But remember... it's fun.

The Written Exam

There is a wide selection of study materials on the market. If you are fortunate enough to live in an area where study classes are offered by a local radio club, by all means enroll. Read and study as much as you can, because the more you understand the subject matter, the more you will enjoy ham radio.

> **"Don't let anyone hang a guilt trip on you for memorizing a few questions that you simply don't understand. Your goal is to pass the test."**

The final phase of preparation is to obtain the most recent copy of the License Manual. Read through the questions and answers several times, circle the letter of each correct answer and then underline key words, key phrases or key numbers in each question and in the correct answer. Do this for *every* question. Review all of the questions several times before you take the exam.


4BG-9.1 What frequency range will be tuned by the circuit in Figure 4BG-9 when L is 10-microhenrys, Cf is 156-picofarads, and Cv is 50-picofarads maximum and 2-picofarads minimum?
[✓ A.] 3508 through 4004 kHz
B. 6998 through 7360 kHz
C. 13.396 through 14.402 MHz
D. 49.998 through 54.101 MHz

4BG-9.2 What frequency range will be tuned by the circuit in Figure 4BG-9 when L is 30-microhenrys, Cf is 200-picofarads, and Cv is 80-picofarads maximum and 10-picofarads minimum?
[✓ A.] 1737 through 2005 kHz
B. 3507 through 4004 kHz
C. 7002 through 7354 kHz
D. 14.990 through 15.020 MHz

Freq. range from:	
10–156–50–2	3508 thru 4004
30–200–80–10	1737 – 2005

Figure 5.

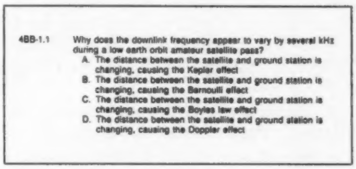

4BB-1.1 Why does the downlink frequency appear to vary by several kHz during a low earth orbit amateur satellite pass?
A. The distance between the satellite and ground station is changing, causing the Kepler effect
B. The distance between the satellite and ground station is changing, causing the Bernoulli effect
C. The distance between the satellite and ground station is changing, causing the Boyles law effect
D. The distance between the satellite and ground station is changing, causing the Doppler effect

Figure 6.

At this point, you will know which questions give you trouble. If you understand the question but can't remember the answer or you simply don't understand a question or block of questions, you have two techniques that will pull you through: outlining and memorizing. If these techniques work for law and medical school exams where you don't have the exact questions and answers available before the tests, they certainly will work on today's ham radio exams.

Outline every question and answer that you don't know absolutely cold by summarizing it in a separate notebook. Your underlinings will help; abbreviate as much as possible. Outlining is another step of imbedding the material in your head (reading–underlining–outlining).

Consider the example in Figure 1, which involves five questions and answers led to the simple outline shown. An outline does not have to be fancy or perfect. Your goal is to set forth the essence of a series of questions and correct answers in a brief format that you can understand.

Mnemonic Devices

Let's get a few things straight regarding memorization before we go any further. First of all, it is not cheating or dishonest to memorize the answers to some questions. Again, keep in mind that the questions and answers are given to us by the FCC. Sure there are purists in our ranks whc frown on anything but total understanding of all aspects of the exams. My answer is that ham radio operators come from all walks of life, and many of us have no training in radio or mathematics. (I never could understand how someone who work with electronics all day for a living could come home and enjoy ham radio as a hobby.) Don't let anyone hang a guilt trip on you for memorizing a few questions that you simply don't understand. Your goal is to pass the test.

Memory devices have been with us since grade school; e.g., Italy is shaped like a boot, and the lines on a treble clef of music are EGBDF, because we all know that "Every Good Boy Does Fine." To call Gambler's Anonymous dial 1-800-LAST BET.

The more ridiculous the association the easier it is to remember. For example, take a look at the four questions and answers in Figure 2 and the underlining. I have always been fascinated by trucks, and as I read this series of questions the word semi popped into my head (semiconductor). I then envisioned a shiny new white semi-tractor with 4000 in chrome numbers on the side of the hood pulling a half size trailer to get low gas consumption with CMOS in bold read letters emblazoned across the sides of the trailer. Ridiculous? You bet. Stick in my mind? Every bit of it.

An example of a less exotic association is Figure 3. The key word is "operational," and the left side of the correct symbol is shaped like an O.

Sometimes you have to use pure rote memory, because you can't come up with a ridiculous association. Figure 4 is a series of five questions that all start out with a 0.01 microfarad capacitor. For test purposes you can omit two megohm and 20 volts, because they are the same in all questions. The two variables are the number of seconds it takes to die down to certain voltage. I outlined the five questions and came up with two rules: "Multiply by almost three" and "2.100 increment." Memorizing one question and its answer will allow you to answer the other four by applying the rules.

Another example is shown at Figure 5. Look at my outline and the circled numbers.

You will note in Figure 6 that "downlink" is a catchy word in the question and "doppler" is the correct answer–both starting with "d."

Memory techniques work for any type of question whether it involves definitions, numbers or schematics. The secret is in using your imagination and pulling out a common thread, a ridiculous association, or a rule of thumb. Plus it's fun.

Taking The Exam

Thorough preparation is the basis for a feeling of confidence and positive attitude on exam day. Walk into the exam room as a winner with your head up—*you are going to pass!*

The night before the exam listen to the QSO format tape, study your outline and your memory aids. It's basic, but get a good night's sleep. Study some more the day of the test if you have time.

A few pointers on taking the code test:

Concentrate on what you are copying and don't try to read what you have written.

Leave a dash for each missed letter.

Copy the consonants the best you can. If you find yourself falling behind, skip the vowels and copy the consonants. It's easy to fill in the vowels when answering the questions.

Copy the main words the best you can. Omit the simple, meaningless words if you're falling behind.

If you anticipate a set of numbers coming because you're in the process of copying "Kenwood" or RST and you're falling behind, don't copy the full word. Copy the first part, then listen carefully to get the numbers.

If you don't know an answer to a question but you have some notes...take a guess. If you have some of the consonants and use your imagination the odds are with you.

The code tests are straightforward rather than being tricky.

Keep in mind while taking the written exam:

Put your hand over the answers while reading each question and then answer it in your head before you look at the possible answers.

If you don't know an answer, pass on to the next question and come back to it later.

When you go back to a skipped question, engage in a process of eliminating wrong answers. Act on a hunch; guess if you have no idea.

If the question calls for a calculation and yours is a few numbers off but is the closer to one of the choices, go with the closest choice.

Don't second-guess yourself once you've marked an answer unless you're sure you made a mistake.

Use some common sense and remember that you can miss 25% and still pass.

The choice of whether to upgrade is yours. Make the right one and get on with it.

Good luck! ■

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NEW! 1409G	144-148	2	160	.6	15	13.6	25	UHF
1410G	144-148	10	160	.6	15	13.6	25	UHF
1412G	144-148	30	160	.6	15	13.6	20	UHF
2210G	220-225	10	130	.7	12	13.6	21	UHF
2212G	220-225	30	130	.7	12	13.6	16	UHF
4410G	420-450	10	100	1.1	12	13.6	19	N
4412G	420-450	30	100	1.1	12	13.6	19	N

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73 Review *reviewed by Stu Norwood*

W5YI Novice Course

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Price: $19.95
Written by: Gordon West WB6NOA
and Fred Maia W5YI

Gordon and Fred, you've made the well-nigh impossible seem easy—well, if not **easy**, at least attainable. I'm confident, if anyone is ever **really** confident, that I'm prepared to go for my Novice license.

Wayne had been reminding me for a couple of years now that I don't have a callsign after my name. In critiques of the magazines I could usually count on him to point out that a callsign was missing after my name on the staff box.

But the last straw happened a couple of months ago when he said in his cheerful way, "You blankety-blank-blank turkey, **when** are you planning on getting your license?" Well, the timing of that gentle reminder couldn't have been better. I just happened to have a copy of the Gordon West Radio School's New Novice Voice Class handy on my desk. I waved the tape and license preparation books at Wayne, and gave my solemn oath: I'll get my license by April Fool's Day.

At this writing, I'm scheduled for my exam in a couple weeks. And as Gordon says, in his inimitable California accent, it was **eeeeeasy!** thanks to the technique, style, encouragement, and reinforcement of this class.

After a rousing musical introduction on the first tape, with greetings from Gordon and Fred, and assurances that Morse code was going to be **eeeeeasy!** I got down to work.

I walked my way through the letters, the dits and dahs of **e**, then **t** and **a** (Gordon says di-dah kind of sounds like an **a** looks). Then the dits and dahs began forming words—ate, tea, at. Just when I was expecting to master code in one sitting, Gordon warns that I shouldn't study for more than 20 minutes at a time.

The class moved on to new letters, **n, i, t, m, s, o, s.** My abbreviated alphabet then consisted of 10 letters. I already knew **v**, thanks to Beethoven. The rest would be eeeeeasy. The tape spurred me onward to a blazing 7 wpm, with Gordon's encouraging, "Hey, not bad, not bad at all!"

The rest of the alphabet began etching itself in my brain. **R, u, k** were easy, the latter two being variations of **r**. I mastered **cq** by listening to the rhythm. Punctuation, numbers, prosigns, were a cinch with the course's use of varying speed, random drills, and the continual reinforcement and coaxing. At the end of the second lesson Gordon says to stand up and take a bow. Somewhere in the distance, I think I heard the strains of Pomp and Circumstance.

On lessons 3 and 4, I stumbled on a few letters: **y, l, f, p.** But with continual repetition they, too, locked in.

During the 3 or 4 hour breaks, when Gordon suggests going out and mowing the lawn, or washing the car, dog, or cat, I had better things to do. I was immersed in the study guide's 302 exact word-for-word Novice test questions—complete with answers and explanations.

This is an excellent license preparation guide—Gordon and Fred are to be congratulated on the content, marketing, and packaging of their course. Morse code, after all, **is** fun, and it **is** easy. The colloquial, informal approach on the tapes works. It worked for me to break my mental barrier to code.

"Okay, you can break the seal on the VEC envelope." Hmmmm, what will my callsign be, KA1STU? ■

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FL-53A 250 Hz 2nd IF CW filter	115.00	109^{95}
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1449
PS-35 Internal power supply	219.00	199^{95}
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109^{95}
FL-53A 250 Hz CW filter (2nd IF)	115.00	109^{95}
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FL-70 2.8 kHz wide SSB filter	59.00	
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IC-735 HF transceiver/SW rcvr/mic	1099.00	959^{95}
PS-55 External power supply	219.00	199^{95}
AT-150 Automatic antenna tuner	445.00	389^{95}
FL-32A 500 Hz CW filter	69.00	
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PS-30 Systems p/s w/cord, 6-pin plug	349.00	319^{95}
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SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139^{95}
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IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249

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IC-27H 45w 2m FM/TTP mic **Closeout**	459.00	399^{95}
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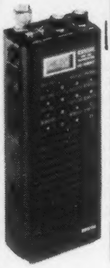

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73 Review *by Larry Antonuk WB9RRT*

AR-460D 3½ Digit LCR Meter

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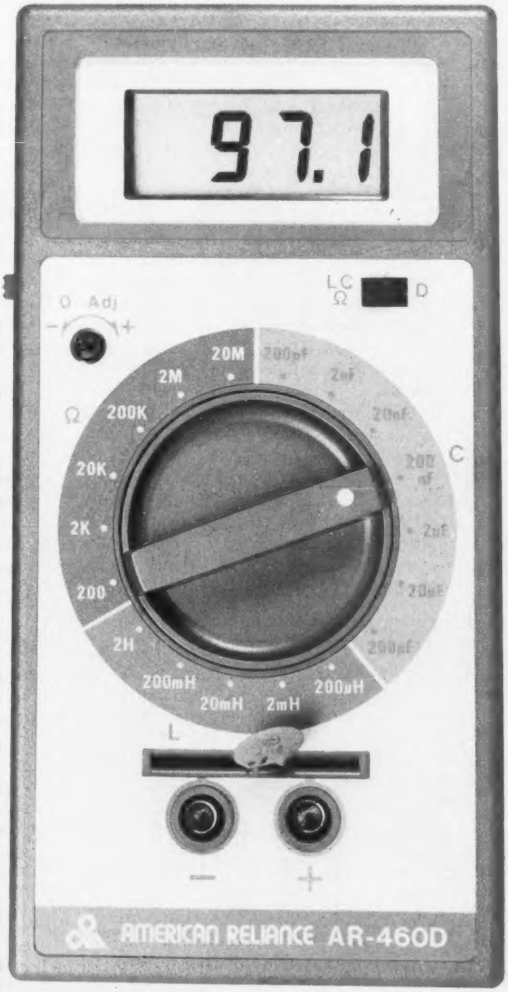


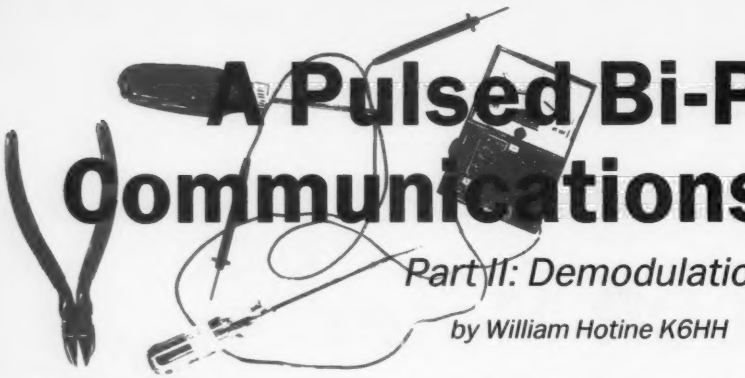
Since the beginning of electronics, the faulty capacitor has been the bane of the troubleshooter. Difficult to test, often intermittent, usually "half bad"—the capacitor is probably responsible for more bald technicians than any other component. As long as there have been bad caps, there have been people whipping up devices to test them. The newest entry in the race is the American Reliance LCR Meter.

The LCR Meter measures just what it says—inductance, capacitance, and resistance. On the L and C functions we also get D–the Dissipation Factor. The unit is housed in a DVM-sized case, with a rotary dial to select function/range. A socket accepts components that can be plugged right in, and two three-inch test leads allow the user to clip larger parts to the meter. Once the components are plugged in, a slide switch selects L-C-Ohms or Dissipation. A fairly nice leather-like pouch comes with the AR-460D, with a separate compartment for test leads. The instrument is fuse-protected, in case the technician tries to measure the capacitance of a live circuit. In a show of thoughtfulness, the input overload fuse is easily accessible inside the battery cover, no tools needed. And even a spare fuse is included!

Measurement range of the unit is quite broad–up to 20 MΩ, 2 henries, and 200 microfarads. The capacitance range is somewhat limited, especially in these days of low-voltage power supplies. Accuracy is no worse than ± 2%, with most ranges being ± 1%. Measurements settle down quickly, with only the normal uncertainty of the least significant digit. According to the manual, the unit needs to be zeroed when testing caps and coils. This seems to be especially important when testing low value caps with the test leads in place. The zero control is right on the front panel, but needs a screwdriver for adjustment (actually, a small square tuning tool works best). The control itself is somewhat tricky to adjust, but should probably not have to be adjusted too often.

Obviously, the worth of an instrument has to be measured by how much time it saves the technician. In this case the user needs to ask just what parameters he needs to measure. The resistance, capacitance, and inductance scales are fairly straightforward. However, things tend to get fuzzy when applying the Dissipation Factor to real-life situations. They were obviously fuzzy for the author of the manual—a small booklet that skirted the whole issue. This is revised with one-page addendum concerning the zero adjust control. In addition, buyers get a copy of a magazine article entitled "The dissipation factor . . . and explanation." Unfortunately, it never really does give an explanation, but rather several formulas that lead to the conclusion that Dissipation Factor is simply the ratio of effective series resistance to capacitive reactance. Or the reciprocal of the "Q" factor. No one ever mentions why anyone would want to know the Dissipation Factor. Nowhere in the booklet, addendum, or article is there a chart that tells us what a good or bad DF is–0.1, 25, a million? The article makes reference to the DF being inversely proportional to the leakage current in a cap. This indicates that a high DF corresponds to low leakage—or did they mean the other way around? The fact is that leakage current is a very useful parameter, but the AR-460D can't measure it. Leakage current is ideally measured at the normal operation voltage of the capacitor. The LCR Meter uses a low voltage 1kHz waveform for its measurements. The unit will determine an out-of-range cap–but it can't tell if the cap will break down with 2.0V DC applied, regardless of how many formulas are used.

American Reliance has a good capacitance, inductance, and resistance meter, but they need to do some more convincing as far as the usefulness of the Dissipation Factor measurement. From a pure troubleshooting standpoint, the lack of a leakage function is somewhat of a problem. For someone who needs to identify unmarked caps, or perhaps hand-pick capacitors to meet certain tolerance values, the AR-460D is a reasonable value. ■



A Pulsed Bi-Phase Communications System

Part II: Demodulation

by William Hotine K6HH

Demodulator Details

Figure 6 is the diagram of the demodulator unit, designed for use at 455 kHz. The 455 kHz sine wave input at about 0.2V P-P is capacity coupled to pin 7 of U_1, which is a hex CMOS inverter. Four of the inverters have feedback resistors from input to output and are capacity coupled. These four inverters amplify the small IF sine wave signal to a 12V square wave at #10, which is inverted again at #12 and drives a Schmitt trigger at pin 12 of U_3 to further square the wave. This square wave is inverted at #10 and is connected to the phase comparator inputs at pins 14 of U_2 and 14 of U_4. U_2 is a phase lock loop centered at 455 kHz, with low-pass filter damping designed[3,4] to minimize the VCO frequency fluctuation, when disturbed by input phase deviations at #14.

The VCO output at pin 4 of U_2 is further squared by a Schmitt trigger at pin 2 of U_3, and then inverted at #4. The squared VCO signal at #4 of U_3 is applied to phase comparator input pin 3 of U_4. U_4 is already receiving the squared input signal at pin 14. The phase comparator output at #13 is filtered at terminal 9, driving an internal source follower with output at #10.

The pulse output signal at pin 10 due to signaling phase deviations is a narrow negative pulse for a leading phase deviation, and a narrow positive pulse for a lagging phase deviation. Deviations as small as one degree of phase produce clear five-volt pulses.

Small 10 pF capacitors couple these pulses to two high-impedance-input operational amplifiers of U_5. One amplifier is connected as an inverting amplifier, and the other as a noninverting amplifier. Negative pulses from U_4, which represent leading phase deviations, are inverted in an amplifier of U_5, the output of which at pin 9 is applied to a diode clipper, which removes the negative component and passes a 3V positive pulse to terminal 3 of U_6.

Positive pulses from U_4, representing lagging phase deviations, are amplified in a noninverting amplifier of U_5. Its output at #5 is applied to a diode clipper, which removes the negative component and passes a 3V positive pulse to #5 of U_6. U_6 is a hex inverter, and resistors bias the inverters to amplifiers at #3 and #5.

The inverted output at pin 2 is inverted again at pin 15 to give a 12V positive "one" pulse, which is connected to "AND" gate input pin 2 of U_8. Also, the inverted output at pin 4 is inverted again at #12, resulting in a 12V positive pulse to drive input #14 of U_7, a PLL centered on 19.6 kHz.

The pulse from #4 is the clock output and is connected to #9 of U_6 to delay it 180 degrees through inversion. The pulse from pin 10 of U_6 is the "clock" pulse and drives terminal 1 of the AND gate of U_8. The "ANDed" output at #3 is a clocked "one" pulse, which drives pin 12 of U_9, a monostable M.V. The output pulse width from terminal #10 is made slightly less than a clock period, so it returns to zero from each "one" for RZ data output. The pulse width could also be made slightly longer than a clock period for NRZ data output.

The system waveforms in Figure 1 (see last month) illustrate how the novel coding is used to encode a program of 101010.

System Recap

To summarize, the sine wave input signal is first squared in U_1, and then its rising edge is made even more vertical by the triggers in U_3, to enable accurate phase comparison in U_2 with its VCO square wave. This VCO square wave is then made more vertical in the trigger of U_3 and compared to the signal square wave in the digital phase comparator of U_4, thus enabling detection of one-degree phase deviations. The phase lock loop of U_2 locks to the average frequency of the continuous stream of lagging phase deviations at the middle of each clock frequency cycle, with the occasional leading phase deviation at the beginning of each clock cycle causing a variation of the VCO frequency of the PLL of U_2. Polarized pulses from #10 of U_4 are then processed in following circuits as described to give outputs of clock and data.

The frequency of 21.4 MHz at the transmitter was used because of availability of the single-sideband filter crystals on the surplus market. Power output was only ten milliwatts, and the antenna only two feet long, to prevent interfering with other transmissions on the amateur 15 meter band. I displayed the single sideband programmed 101010 transmitted at

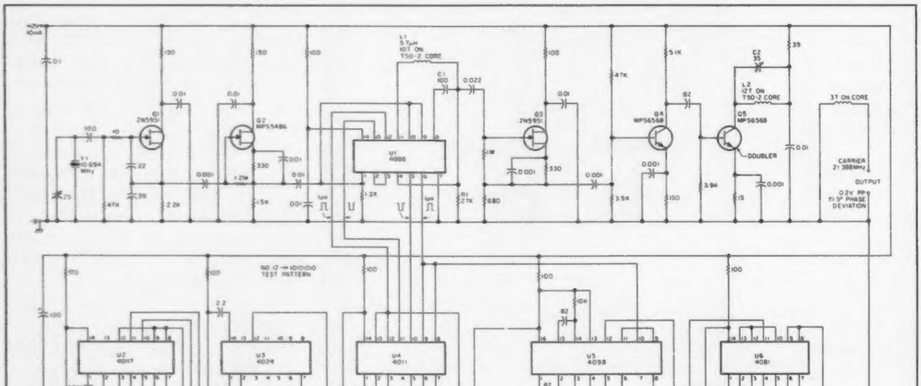
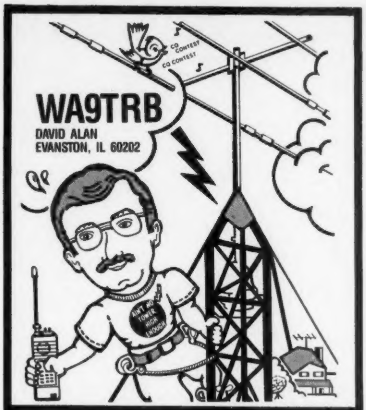


Figure 6. Diagram of the demodulator unit, designed for use at 455 kHz.



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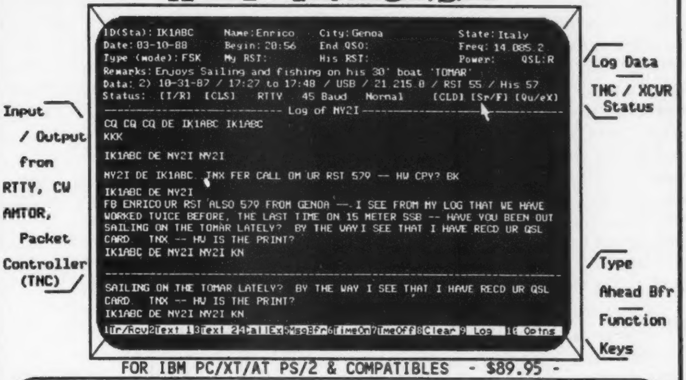

```
ID(Sta): IK1ABC      Name:Enrico    City:Genoa          State:Italy
Date: 03-10-88       Begin: 20:56   End QSO:            Freq: 14.085.2
Type (mode):FSK      My RST:        His RST:            Power:    QSL:R
Remarks: Enjoys Sailing and fishing on his 30' boat 'TOMAR'
Data: 2) 10-31-87 / 17:27 to 17:48 / USB / 21.215.0 / RST 55 / His 57
Status:  [I/R]  [CLS]   RTTY   45 Baud   Normal    [CLD] [Sr/F] [Qu/eX]
----------------------------- Log of NY2I --------------------------------
CQ CQ CQ DE IK1ABC IK1ABC
KKK

IK1ABC DE NY2I NY2I

NY2I DE IK1ABC. TNX FER CALL OM UR RST 579 — HW CPY? BK

IK1ABC DE NY2I
FB ENRICO UR RST ALSO 579 FROM GENOA —. I SEE FROM MY LOG THAT WE HAVE
WORKED TWICE BEFORE, THE LAST TIME ON 15 METER SSB -- HAVE YOU BEEN OUT
SAILING ON THE TOMAR LATELY?  BY THE WAY I SEE THAT I HAVE RECD UR QSL
CARD.  TNX -- HW IS THE PRINT?
IK1ABC DE NY2I NY2I KN

--------------------------------------------------------------------------
SAILING ON THE TOMAR LATELY?  BY THE WAY I SEE THAT I HAVE RECD UR QSL
CARD.  TNX -- HW IS THE PRINT?
IK1ABC DE NY2I NY2I KN
1Tr/Rcv 2Text 1 3Text 2 4CallEx 5MsgBfr 6TimeOn 7TmeOff 8Clear 9 Log 10 Optns
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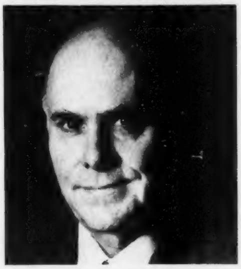

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21.4 MHz on a spectrum analyzer with the sweep calibration 0.7 kHz per division. The signal bandwidth is less than 1 kHz. Random data would probably occupy a slightly greater bandwidth; the frequency excursion of random data would be greater than the test program of 101010.

This system definitely offers some exciting opportunities for experimentation: It uses simple circuits with inexpensive components, and the prospect for high baud rate data with a narrow associated bandwidth should stimulate interest on many fronts.

Idea For The Road

I have a new electronic typewriter with an LCD display of the typed before printing. Why not make a new digital communication method without computers (which are expensive)? A small keyboard with an LCD display of a few lines above it would comprise a small digital communication unit, a modern radio teletype system capable of written message transmission on any band, using the new digital transmission system, and would be comparatively inexpensive. Amateurs could easily make their own, like back in the old days when everybody did it!

References

1. Hund, August *Frequency Modulation*, pp. 32-40.
2. Hotine, William. US Patent #4,656,647.
3. Best, Roland E. *Phase Locked Loops*. McGraw-Hill, NY.
4. Berlin, Howard M. *Design of Phase Locked Loop Circuits*. Howard W. Sams & Co., Indianapolis IN.

Ed. Note: Figure 4 from last month and Figure 6 from this month have been transposed. Figure 4 is the demodulator schematic, and Figure 6 is the transmitter schematic.

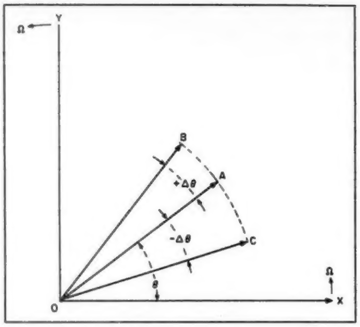

Figure 7. Vector representation of mechanics involved in the pulsed bi-phased digital modulation system.

Phase Modulation Details

A vector representation of the mechanics involved in the pulsed bi-phase digital modulation system shows the modulation action clearly.

Leading Angle Pulse

With reference to Figure 7, the XY coordinate system is spinning counter-clockwise with the constant angular velocity $2\pi F$, where F is the center carrier frequency. The line OA denotes the position of the unmodulated carrier current vector of length I_m.

When a rectangular leading angle pulse occurs, vector OA shifts to position OB during the rise time of the pulse and adds a small velocity to the angular velocity $2\pi F$. The carrier F returns to its original velocity during the dwell time of the flat top of the rectangular modulating pulse. During the fall time of the pulse, vector OB returns to position OA and subtracts a small velocity from the angular velocity $2\pi F$.

Phase modulation takes place during the nanosecond times of rise and fall of the modulating pulse only. One cycle of 10 MHz is 100 nanoseconds long. If we assume that modulation takes place in only 50 nanoseconds or less, then modulation products are produced only during one-half cycle or less of the carrier. At a modulating frequency of 20 kHz, one clock cycle is 50 µs long, or 50,000 nanoseconds. The time of modulation is then 50 divided by 50,000, which equals 0.1% of the average transmission time of a clock cycle.

Lagging Angle Pulse

When a rectangular lagging angle pulse occurs, vector OA shifts to position OC during the pulse rise time, and subtracts a small velocity from the angular velocity $2\pi F$. The carrier frequency F returns to its original velocity during the dwell time of the flat top of the rectangular modulating pulse. During the fall time of the pulse, vector OC returns to position OA, and adds a small velocity to the angular velocity $2\pi F$.

The phase modulation takes place in a similar manner to that described above.

For any pulse, the phase deviation from frequency F will then be $2\Delta\Theta$, where $\Delta\Theta$ is the phase angle deviation of the vectors. The sideband width will be $2f\Delta\Theta$ where f is the modulating frequency, and the sideband will be spaced f from the carrier. As there are 2π radians in 360 degrees, it takes 2π radians of phase angle deviation to change the carrier frequency F by one hertz. A program of alternate "ones" and "zeros" (10101010), which has two pulses for a "one" and a pulse for a "zero" has an average frequency of 1.5 f_c where F_c is the clock frequency. Then at the clock frequency of 20 kHz, with a phase deviation of .02 radians, we can calculate (2 x 1.5 x 20 x 20,000 x.02)/6.28 = 191 Hz, the width of a sideband.

This calculation gives less bandwidth than was shown on a spectrum analyzer, the accuracy of which is in question, because of the unknown factors in its response to signals of this type. However, the analyzer showed an 800 Hz bandwidth at a sweep time of one second. Slower sweeps which would give the narrow filter of the analyzer time to respond accurately were not available. The crystal carrier oscillator may also contribute some random phase noise which would widen the sideband.

As the sine wave carrier is modulated approximately only 0.6% of the time, and then only by a 1.2 degree phase deviation, it can be realized that the signal is a 99.4% pure sine wave, with a half cycle phase disturbance the only wave distortion. Maybe this accounts for the revolutionary narrow bandwidth of the system. Further mathematical analysis will explain this better than the writer can.

Information theory says that to transmit information at the rate of n bits per second requires a bandwidth of two times n cycles per second. To mark the start and finish of each bit requires that the signal be first turned on, then turned off. A cycle is defined as one full swing between on and off. Within a single cycle, it is not possible to know whether the bit is on or off. Within two cycles, though, one can determine whether both cycles are the same (bit on) or whether one differs from the other (bit off). In the case of the present system, bit off is 99.4% of the time, and bit on is only 0.6% of the time. This differs from sinusoidal modulation, in which the cycle periods are equal for both bits, and in which bits equal frequency.

Present information theory has been derived from these facts of sinusoidal cyclical modulation and does not apply to the new facts of the very fast transients used to phase modulate the carrier in the new pulsed biphase modulation system. In the new system, it seems that the least disturbance of the phase of a carrier occupies the narrowest bandwidth.

The noise problem is alleviated in the present system by its method of amplifying the received sine wave to the 12 volt logic level while preserving the crossover point of the sine wave as the leading edge of the logic level square wave. Amplitude noise equal to or greater than the carrier is amplified above the logic level and is thus cut off. It is well-known that a phase lock loop can track signals that are submerged in noise by use of phase discrimination.

The present system uses a digital phase comparator which is much more sensitive and accurate than the old phase comparators, and should be capable of tolerating a high noise level with undiminished accuracy, because noise cannot simulate a leading phase angle of a continuous sine wave and thus cause a false one to be detected.

A parting rhyme is apropos, answering all the theoreticians and mathematicians:

The bumble bee is oddly wrought.
Aerodynamically it ought
To find it quite impossible to rise!
But bumble bees don't know the rule,
'Cause bumble bees don't go to school,
They flies!

—Courtesy G3VMR

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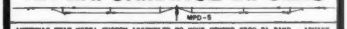

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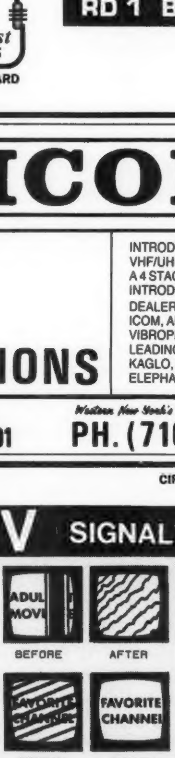

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How Not To Run A Novice Class

Where visions of grandeur were mercilessly QRMed.

by George Willard KC0ES

I stepped confidently into the classroom. I knew I was going to revolutionize the teaching of ham classes. Rather than the crew of prospective Novices, my eyes were filled with visions of fame, fortune, and manufacturers eagerly pressing free samples of their latest gear on me, hoping to bask in the reflected glow of my prowess . . .

When and How It Started

I received my Novice ticket about a year ago. I felt like the king of hams when my Elmer told me he never knew of anyone going from Novice to Advanced in 91 days. Not really remarkable, but I didn't know that, either.

Soon after, I inherited a collection of amateur periodicals, the contents of which I eagerly read, including many articles on teaching Morse code.

Horrors! I discovered I had learned it all wrong! Elmer had handed out written sheets with the code *drawn out* on them! That was guaranteed to put a permanent 10 wpm ceiling on the victims of this system.

"Look, George," said Elmer, "I've taught classes for ten years, and turned out hundreds of new hams, including YOU. Why rock the boat?"

"But look here! It says in *QST* and other places that the only good way to learn code is by sound! Learning visually puts extra loops in the mental process!" I felt cheated. "I could have upgraded in three weeks if you'd taught me *right*!"

He fixed me with a measuring look. "Listen, hotshot, I don't go for all that psychology crap! In the Navy we learned the characters, and then it was just practice, practice, practice! But I'm willing to go along for the ride. They may have learned other new things since I started besides how to operate a rig without neutralizing it."

I blushed, remembering when I'd demonstrated my first station to him. The transmitter, an Old Viking Valiant, gave out loud hums and blinding blue light from the mercury-vapor rectifiers whenever I switched from standby to transmit. I sent with one hand on the key and the other on the VFO. I thought those old rigs were *supposed* to drift about 50 Hz per second!

"Anyway, suppose *you* run the next class. I'll go ahead and arrange for the classroom at the Army Reserve building. You find someone to help you do the class, and we'll see how you come out."

Heady with my victory over stubborness, I immediately drew up and printed posters for all the schools, electronic stores, and public bulletin boards in town. I sent notices to papers and radio stations, and went on a local TV talk show, to tell one and all of the wonders of ham radio!

When the big night came, I was *ready*! I carefully packed my books, sample magazines, a prepared list of letter lessons, 610 forms, home-brew, high-tech digital code practice oscillator (a quad NAND gate in a metal box weighing about 8 pounds and taking up ⅓ cubic foot), and—the *pièce de résistance*—a nice new Vibroplex bug! Elmer had always congratulated me on having a good fist, and I knew *this* would let me send good, clean, fast code.

I was a half hour early, as was Charlie, who agreed to help me in this endeavor. He came from the same Novice class, and was likewise forward-thinking and progressive. We had brain-stormed the night before, planning everything with a precision that would make Joint Chiefs of Staff envious.

The Motley Crew

Several students were already in the building when we arrived. One couple, obviously married, buttonholed us as we walked in the door.

"Is it true that a ham license will let my husband enlist in the Navy as a chief petty officer?" asked the petite blonde. I looked at her husband, about 6'2" and 350 pounds, standing behind his wife with head hung down and a wistful look in his eyes.

I turned helplessly to Charlie who had a baffled expression, similar to a Baptist minister when asked for the time of the Sunday School Orgy.

"Uh, I'm not sure about that. Maybe you ought to ask the recruiter," I replied, trying to stay on safe ground.

"We did," the small woman shot back, "and he just got a look on his face even dumber than yours!"

"Uh, dear," came a high, piping voice. I looked in vain for the pixie. "I'm sure if your brother said it, it must be true. I'll find out when I get to San Diego." Yeah. It was the big guy.

I turned from the odd couple and almost turned back. There in front of me stood a QCSSA (Quarter Century on Social Security Association) candidate wearing a cap with flashing LEDs, a propeller, and a transparent visor featuring a windshield wiper. A "Boogie in Your Rockin' Chair" button adorned the lapel of the broad-striped suit jacket worn over a pair of pink and blue plaid slacks.

"Hi, guess you must be the teacher!" this apparition boomed. "I'd hoped for a prettier one, but I guess you'll do—can't be too choosey at my age!"

As I backed away trying desperately to remember which door opened on the small-arms storage, he slapped himself on the knee and doubled over with a big laugh. "Gets 'em every time! I'm Farmer Fred from the morning Pig Pen Follies on Creosote, Missouri's, radio station! We call it Downtown Radio 'cause we cover about 3 blocks of downtown! I ain't learned nothin' new in nigh on thutty years, and I thought it was about time to try."

My near-shattered nerves were calmed by the appearance of a group of high-school students, a grandfather/grandson pair, a collegiate type, and several middle-aged people of average sex. I was not prepared, however, for the next student to enter the hall.

She had flaming red hair, a stunning figure, and an obvious aversion to heavy clothing.

"Hi, I'm Darlene Bedspread! Is this the radio class? I'm just so excited about becoming a ham! I just know one of those cute little two meter rigs I've read about will look great in my Ferrari!"

I became aware of an acute pain in my face. I realized my eyelashes had become snarled in my eyebrows, and the urge to blink was becoming stronger.

"Oh, I just love big, strong, handsome, fat geniuses like you! I hope we can work together closely."

I then observed the poor thing also had a phobia about undergarments. Gee, ham radio would be just the avocational therapy for her! I resolved to give her special attention. She obviously needed my personal help.

Just as I became aware of another pain growing in my jaw, my vision was blocked by the sight of a bulging shirt framing 13.37 square inches of hairy flab above a belt buckle that read, "I gave my sweetie a 12-gauge instead of a ring."

"Are you the teacher? How yuh gonna teach mah Darlin' Darlene an' me 'bout this here CB stuff if yuh cain't move yore mouth?"

"My trap slammed shut, cracking a tooth, as my dream of the life as a rich gigolo evaporated. "Uh, guess it's about time to start. Just go in there and find a seat."

The Class Gets Underway

Charlie emerged from behind the bathroom door, where he had taken refuge right after the first couple, and said, "Looks like a typical group, George."

With a deep, shuddering breath, I pulled myself together. He was right. A ham class is made up of a "diverse" mix of people. Could I help it if this group was *really* diverse? We were confident, however, that our plan would work for *anybody!*

We walked into the room and onto the dais.

"Hello, class! Welcome to the wonderful world of amateur radio! This hobby is many things to many people, and just to start things off we'll tell you a little bit about us. I'm George, your code instructor, and this is Charlie, who will teach theory and regulations. Charlie, go ahead and tell the class how you enjoy amateur radio."

"Well, gee, George, I guess I didn't mention it when we were planning the class, but what with moving into our new house, the baby coming, and my chauffering the older kids to soccer practice, I haven't been on the air yet. But I sure want to say that I think it's a neat hobby, and I'm sure I'll get a rig one of these days and really enjoy it!"

"Uhhh . . . right, Charlie! Well, we'll just start off by going over the official FCC definition of amateur radio!" I felt like Monty Hall discovering that the contestants in the space alien costumes really were space aliens.

I looked around for the chalk. No chalk. I looked further. Still no chalk. Aware that the class was watching me as if they expected me to grow long ears and start braying, I was relieved to spot the Quartermaster passing by the door.

"Hey, Bill! Do you have any chalk?"

"Yeah, but its locked up in my office. You gotta have Form 16-526b Rev.8. You got Form 16-526b Rev.8?"

"No, but I'll happily fill out, in triplicate, if that's what it takes!"

"No, quintuplicate, but if you don't have a Request for Forms, number A93.787, I can't give you one, anyway."

"Can I get a Request for Forms, whatever you call it?"

"No, it takes a Request for Forms, number A93.787 to request a Request for Forms, number A93.787."

"Well," I said weakly to the class as Bill wandered off, "at least we know how to stop Russians. Steal all their Request for Forms forms, and in six months, they won't be able to move a lawnmower, much less a tank." This drew weak chuckles from the aspiring Navy Radio Chief, who was quickly silenced by his wife.

Starting off slow, Charlie and I gave them the requisite information, which they dutifully copied down.

"Okay, gang, now it's time for the code. Let me set up the old practice set, and you will start learning a new way to talk to others."

I opened my brief case and looked around for an outlet to plug in the oscillator. None on the dais. None on the wall behind the dais. Aha! there's one over on the side! Now to just slide the desk over that way so the cord can reach . . .

No way. Why didn't I think to put more than four feet of line cord on the box? Oh well, I'll just use one of the student desk-chair combos. Hmmm. These things are tighter than I remember from college days. Seems I overlap the desktop a bit. Never mind, there's plenty of room to lay my arm sideways in front of me . . .

Did you ever try to use a Vibroplex when it was sitting sideways on a slanted surface? Gravity on the weighted armature rendered the bug useless.

"Uhhh, that's OK, class. We'll learn to *speak* the letter sounds! That's a good thing, anyway, since you can practice code at home by sounding out the letters in books, signs, and so forth."

They looked at me with the silent skepticism of a group of rabbis attending a lecture on the virtues of pork farming.

"All right, let's start with the letter "A." Repeat after me. Di-DAH! A! Di-DAH! A! Di-DAH! A!"

This actually worked out okay, with the class soon getting into the spirit of things and di-dah-ditting messages back and forth. "Belt-buckle" was little slow on the uptake, which was all right, too, as Darlene beeped me some messages that should have been bleeped. That stopped when Loverboy, evidently more advanced than I thought, used ICG (Interrupted Continuous Growl) to specify just what he intended to do with me if I didn't keep my paddle fingers to myself.

Looking Good . . .

After about eight weeks, the class showed code proficiency, and, looking at their exams, I was certain that all had passed. Those were the days when the instructor sent the exams to Gettysburg for grading, so I gathered them up, thanked the class for their interest, got promises from all to call me as soon as their licenses came, and shook hands with Charlie as we walked out the door.

"I guess we showed Elmer that we can run a modern Novice class, huh?"

"Yeah, I suppose so, George. By the way, I think I'm going to give up ham radio and go into full-time youth athletic umpiring."

Well, there are just guys like that.

"Honey, I'm home! They all passed!"

"Hah! That *hussy* passed the first night, and every chance she got since!"

"Oh, come on! That was just innocent flirtation! She couldn't help herself. This hobby will be a big help to her."

With a suspicious look, my wife replied, "She could help herself, and I bet she has, plenty! Besides, I think she already has a hobby!"

"Well, it's over with now. Do you have any stamps?"

"No, I don't. Want me to mail those for you?"

I handed her the precious manila envelope.

Time Goes By . . .

After a couple of months, the phone rang. "Hello, George, this is Fred. Shouldn't we be getting our licenses by now?"

"Yeah, but they might have had a delay. I haven't heard from anyone else, so I'm still sure you passed. Let me know when they come in."

Three weeks later, I got a notice that there was a postage-due for me at the post office.

To my horror, I saw the clerk pull out a large manila envelope with a single first-class stamp in the corner, and the words "Dead Letter Office" imprinted upon it. The exams! Oh, NO!

"Government agencies will not accept postage due mail, and there was no return address on the outside."

I thought of calling all those students and explaining that their exams were invalidated because they didn't get back to Gettysburg within 30 days. I thought of Mr. and Mrs. Navy, Farmer Freddie, and Belt Buckle. I thought of my wife thinking of Darlene.

Three weeks later we moved out of our apartment and into a suburban home. With an unlisted telephone number. I wonder if the FCC will give me an unlisted license?

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Continued from page 6

use instead of being destroyed. He designed the early tuning units. I still have his original Model 12 Teletype and converter.

Then there was Sam Harris W1FZJ, whom I first worked and visited as W8UKS out near Cleveland in 1951. Another genius. Sam did much of the early moonbounce work. He's the chap who built the first parametric amplifier—on six meters. I believe it was this invention that gave MA/COM their big start as Microwave Associates. Sam moved to Arecibo and was an engineer on the big dish there.

He ran a VHF column for me when I edited *CQ* from 1955–1960. He was not only a genius, but had a world class sense of humor. I remember visiting him when he had the Arecibo dish set up on 1296 MHz. We were able to work hams all over the US and Europe via the moon.

I wrote recently about Ron Hessler VE1SH, another good friend. Ron did more for Canadian amateurs than any other ham. How much appreciation have you ever seen for his years of dedication and accomplishments? If we're not going to honor our heros while they're alive, I guess we can do it later, right?

So where were the honors for these hams who've done so much for our hobby while they were alive?

Timely Bouquets

We still have some old timers around who should be given our appreciation. How about some honors for these pioneers? Like John Kraus W8JK, who I think is still around? I used his Twin-Three antenna for years with incredible success. And many of us are using his helical antenna.

Then there's Copthorne MacDonald, the chap who developed slow-scan television. And Jack Babkes W2GDG, who pioneered narrowband FM back in 1946 and went on to start Sonar Radio to manufacture the first narrowband FM equipment?

Old timers will remember working Gus Browning W4BPD from dozens of countries. Gus still publishes a delightful DX newsletter. Too bad if you didn't work him from Sikkim, Afghanistan or many of the African countries. He sure made DXing a lot of fun for years.

More recently Lloyd and Iris Colvin W6KG have been giving us DXpeditions by the gross. And how about Danny Weil and the Yasme, back in the late 50s?

Brickbats

It probably isn't fair to run down the honor roll of hams who have made our hobby what it is without also giving credit to the scoundrels for their part in making the hobby miserable.

Let's see . . . I shouldn't forget Don Miller W9WNV, who fooled thousands of us with his bogus DXpeditions—like signing a Heard Island call when operating from near Vancouver. The last I heard he was in prison. Then there was Max Meyers W2BIB, who used to get his jollies jamming medical emergency and State Department traffic into Africa. And then there's the W0 I've always given credit to for inventing the imaginary DXpedition. He sat in a hotel room in Casablanca and signed the calls of six different West African countries. You have to admire original thinking like that.

We've lots more scoundrels for whom we can be proud. There's the couple who took ICOM for a few million—the two hams who scammed us out of hundreds of thousands of dollars with frequency counters (and, bless them, are at it again)—the ham who sold Collins gear he didn't have through *QST* ads (and was convicted)—the ham dealer in Chicago who was eventually convicted.

Back to Bouquets . . .

We've a lot more real ham heros we've shortchanged—like Boyd Phelps W0BP, Ed Conklin W6KA, Faust Gonset, Wes Schum W9DYV, who was the main sideband developer with his Central Electronics equipment, John Costas K2EN, who pioneered double-sideband for GE, but was out-politicked by Art Collins W0CXX and his single-sideband. How about Bill Welsh W6DDB, who's licensed more Novices than any other ham in history?

How about it? I'll bet many of you know a ham who should be honored while he's still alive. How about writing and telling me about him (or her)?

More Awards

If there are some who've become silent keys without our appreciation, I'd like to have you write about them, too. Have you any nominations for an Unsung Ham Hero award? Or for an Unsung Ham Scoundrel award?

Our hobby is missing something by not having such an honor—a formal honor. For many years, GE sponsored the Edison Award. Sometimes this was given for good reasons, sometimes not, so its value was diluted.

Bill Welsh got it back when he was generating Novices in the Boston area, before he moved to California and got the Lockheed Club W6LS involved. Since then he's given us a whole new generation of hams. That was an Edison Award I agreed with.

If you agree with me that there's a need to honor deserving hams while they're still alive—to let them know we appreciate what they've done to make our hobby more fun—then I'll arrange for the award to be financed and organize it.

What I have in mind would be much like the Nobel Prizes in concept. While we had just one Edison Award a year, I don't see why we can't honor more than one ham a year. If we think there is more than one who is really deserving, why not have two or three? These would be much like a college giving honorary degrees. Say, we could call it an ArD, a Doctor of Amateur Radio degree.

If you're serious about this we can get started right now. The first step would be to propose someone for the ArD degree. I'll set up a small group of ham industry hams to make the first sort. Their proposals can then be published so you can vote for the ones you think should be winners. The winners would be honored with a nice plaque at the Dayton Hamvention—and would also be featured on the cover of *73*. (See the 1988 Education and Technology Achievement Awards discussed in OpEd in the March issue).

I'll organize a Ham Industry Sifting Group. You start proposing hams you think should be honored. Though I'm tempted to have some sort of booby prize for the hams who've hurt us the most—who was that ham in Watts who devoted much of his life to being nasty on 20m? No, better we think positive—of chaps like Ralph Taggart WB8DQT, who's done so much for us with weather satellite facsimile reception. We've had some industry giants too, such as Rex Bassett W4QS, Leo Myerson W0GFQ, James Millen W1HRX, Ted Henry for his 2K amplifiers and Dick Ehrhorn W4ETO for bringing us the CX7 transceiver and his Alpha amplifiers.

An ArB (Blackguard) award is tempting, but who needs the law suits? Besides, if we had such an award, we'd have hams vying for it for sure—which we don't need.

Asia Again

With our dollar still dropping in value, in another year or two it may cost too much to visit Asia any more. If you can get away for just two weeks this October you can join me visiting Tokyo, Seoul, Taipei and Hong Kong. For a little more you can go on to Macau or China. Are you game for a little Great Wall climbing?

The tour leaves October 8th and will get you to the consumer electronic shows in all four cities so you can see what's going to be sold here next year. I'll be along, looking again for some manufacturing help from one of the hundreds of small firms that one can only find at shows like these.

This electronic tour is arranged by Commerce Tours and is expertly organized. First class hotels—superb breakfasts—several banquets. There are usually 150–300 on these tours, many of them hams. The cost? Around $3,200. If you're interested then block out October 8–23 on your calendar and ask me to send you the details. You'll have to sign up early so you can get the needed visas. Write Wayne Green, Asia, WGE Center, Peterborough NH 03458. Yes, you can come from anywhere in the world. Substantial groups from Europe and Australia have joined past tours.

I'll see how difficult it is to get a ham permit in Japan. That situation seems to have eased a great deal. Taiwan is still a problem, but you may be able to get on the air from BV2A while we're there. Hong Kong is a snap, so you might want to bring a 2m HT. I do.

It used to be easy to get a ticket in Korea, but then things got unfriendly. I'll see how the government is doing on this and let you know before we leave. I was issued HL9WG and made many contacts through a 2m repeater there on one trip. How friendly is Korea with Americans—and that's what it all comes down to—I'll let you know.

If you do decide to go on the Asian CES tour I'll guarantee you two things—One, you'll have the time of your life. Two, you'll never forget it. I've been going on this tour for ten years now and I still enjoy it enormously. The food—the fantastic sights—the wonderful people. You coming?

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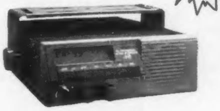

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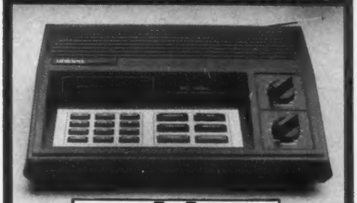

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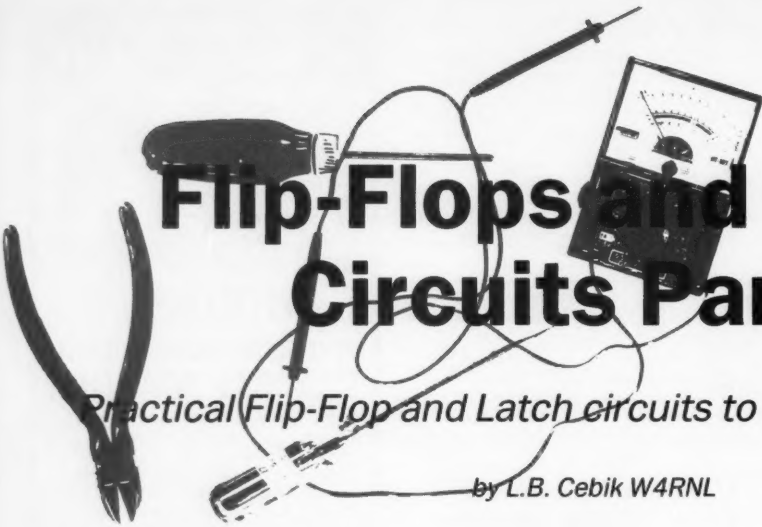

Flip-Flops and Latch Circuits Part 2

Practical Flip-Flop and Latch circuits to build, test, and use.

by L.B. Cebik W4RNL

Flip-flops as Shift Registers

A shift register is a circuit that takes data (one or more HIs or LOs) and moves it from one place to the next. Suppose there are 4 storage places, as in Figure 12. When taking the data from the state of the SI input, there is a serial input shift register. When taking data from the 4 PI inputs, the shift register is parallel input. It's possible then to move data from either source to the right toward output SO, the serial output. It shows the latest data after each clock pulse. The experimenter can also take the revised pattern of data from the PO terminals after each clock pulse. Thus, he gets the abbreviations SISO (serial in, serial out), SIPO (serial in, parallel out), PISO (parallel in, serial out), and PIPO (parallel in, parallel out), sometimes seen in shift register articles.

There are numerous all-in-one shift register chips, but these ICs have limited control capabilities. To see all of the controls one can exert on a shift register, consider basic flip-flops again. Just two 74HC74s can make a shift register, as shown in Figure 13. Once an experimenter has mastered the ways to control a shift register, he can select a more compact arrangement in a single chip if the application requires only a few of the controls.

The serial input goes to the data pin of the left-most flip-flop. Whatever value (HI or LO) appears here is shifted to the second flip-flop whenever the clock line shifts from LO to HI. That value continues to shift right with each clocking, since whatever appears on the D input appears at the Q output, which is connected to the next D input. The last Q output represents a serial output for the string of flip-flops. Note also that it's possible to use the −Q output for values opposite to the original.

The builder can also set the flip-flops with a parallel code. In Figure 13, LOs go wherever needed, since the resistors hold the Clear input HI in the rest state. LOs on the clear line immediately show up as LOs at Q and HIs at −Q, if beginning with the preset lines HI. In this case, tie the D input of the leftmost flip-flop to the positive supply voltage. Reverse this by holding the clear lines HI and impressing LOs on the preset lines (which would be HI at rest with pull-up resistors). A LO on preset appears as a HI at Q, and a LO at −Q. For this alternative, ground the D input of the leftmost flip-flop. Once the flip-flops are set, remove the LOs from the inputs. In other words, only a brief pulse at each flip-flop input line is needed to enter the parallel code. For these experiments, if the circuit is wired as in Figure 13, use a jumper to ground the clear line and then remove the jumper. Using the clear line removes the worry about debouncing the pulse.

Once a LO hits the clear input, the Q and −Q outputs change and stay changed until further input. As a start, place a LO on just the leftmost Clear input and watch it move along as the clock pulses proceed.

Once having entered the parallel code, it's possible to shift it right with a clocking pulse, just as was done in serial shifting. In fact, the experimenter can take the parallel code out the right end of the register in serial order, using either the Q or −Q output. Be sure that the first element desired is entered into the rightmost flip-flop and the last element desired is entered into the leftmost flip-flop. In a practical circuit, this operation requires a timing pattern consisting of a period of time

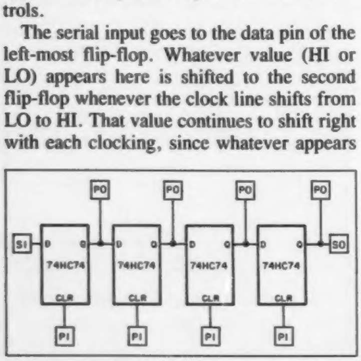

Figure 12. Basic flip-flop shift register.

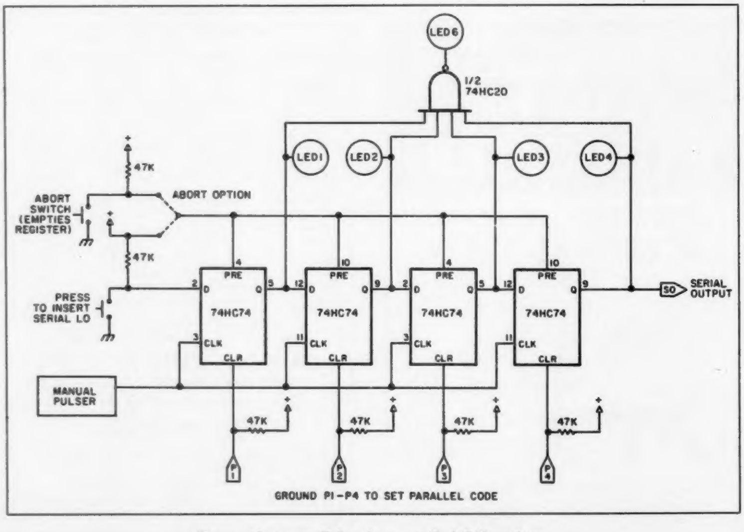

Figure 13. A parallel-code controlled shift register.

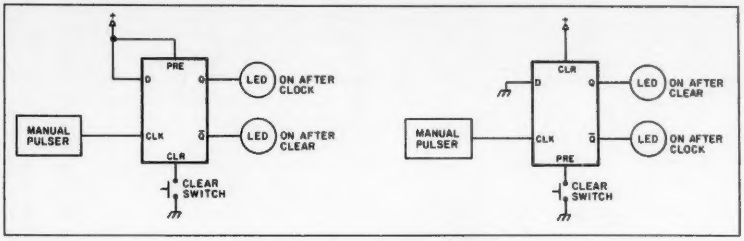
+
PRE
D
Q
LED
ON AFTER CLOCK
MANUAL PULSER
CLK
Q̄
LED
ON AFTER CLEAR
CLR
CLEAR SWITCH
+
CLR
D
Q
LED
ON AFTER CLEAR
MANUAL PULSER
CLK
Q̄
LED
ON AFTER CLOCK
PRE
CLEAR SWITCH

Figure 14. Basic flip-flop controller circuits.

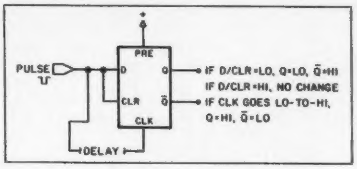
+
PULSE
PRE
D
Q
CLR
Q̄
CLK
DELAY
IF D/CLR=LO, Q=LO, Q̄=HI
IF D/CLR=HI, NO CHANGE
IF CLK GOES LO-TO-HI, Q=HI, Q̄=LO

Figure 16. A delayed pulse controller.

to enter the parallel code and then four clock pulses to remove it serially. For these experiments, the manual pulser can move the code one step at a time and examine the results during these steps.

Why not take the outputs in parallel fashion from either the set of Q outputs or the set of −Q outputs? This allows some interesting possibilities. For example, if the register had 8 flip-flops, a user could enter an 8-bit code. Then he could use the rightmost four Q outputs to get the first four bits, clock four times, and take the last four bits from the rightmost outputs. Another application might use gates tied to each Q output to form a detector, such as the LED detector shown in Figure 13. If any flip-flop holds a LO from the clear input, then the clock keeps operating. When every flip-flop holds a HI (due to the HI on the leftmost D input, which fills in behind the shifting LOs), the detector might do something more than extinguish the LED. It might shut off the clock, preparing the register for a new code entry. This scheme would be applicable to both serial and parallel output uses.

Suppose a user wants to clear the register before it had gone through all its shifting cycles. In Figure 13, I made sure all the preset lines were HI so that the register would set properly using LOs to the clear lines and used only a brief set of pulses to the clear inputs. Setting the preset lines LO puts all the Q outputs to HI. With the detector just mentioned, the clock would stop, and the register would be ready for a new code entry. This type of abort operation may be handy in error detection circuits. Of course, if the register set initially with a code entry through the preset lines, making the clear line LO will force all the Q outputs LO, thus clearing the register in that mode of operation.

Given all these control possibilities, the user should probably start any register design on paper with individual flip-flops. Once having determined all the control needs, he then can look through the data books to see of there is a more compact shift register that provides what he needs with fewer chips and connections. The user can always go back to basics if he finds that a certain control will come in handy.

Among the 74HCOO-series ICs, there are numerous single package shift registers. The 74HC194 and -195 have 4-bit parallel inputs and outputs, but the 194 adds a serial input. The 74HC164 through -166, along with the -594, -595, -597, -598, -299, and -323 offer 8-bit shift registers in various configurations of serial and/or parallel inputs and serial or parallel outputs, with some limited controls that include tri-state outputs.

Flip-flops as Controllers

The basic flip-flop switch debouncing circuit in Figure 4 gave the most fundamental flip-flop control. That application didn't require data and clock inputs. However, for some types of control needs, those inputs come in handy.

Figure 14 shows one kind of control in two versions. Here a short enable pulse enters the preset or clear input to set Q and −Q. The control will involve a short-term operation turned on by the Q or −Q values. Note that the data input holds a constant value which—if clocked through to the Q and −Q outputs—would disable the operation. The applications requires a LO-to-HI transition from the operation that marks the completion of its work. (Of course, one can use a HI-to-LO transition by inserting an inverter in the line.) With the right transition, feeding it the clock input will shut down everything. For example, a builder might use the output of the shift register detector to signal when it was empty and shut down data code processing operations. The key points, again, are separate sources for start and stop signals and a constant value for the data input.

Figure 15 operates by similar principles, but in reverse order. Whenever the source has anything to pass on, it sends a LO-to-HI clocking transition. This passes on a HI from the D input to the Q output, where it signals a processing chip to accept the data. If the processor cannot accept the data, perhaps because it is full, it sends a LO to the flip-flop clear input, which overrides the clocking and holds the Q output LO. This controller forces a repetition of the data entry, because the flip-flop ignores the clock as long as the processor is not ready for values to process. The user may then employ this circuit to control the input of a storage buffer that follows a keyboard. When the buffer is full or not ready, a keypress will produce nothing.

A variation on these circuits appears in Figure 16. In this circuit, the tester ties the data and clear lines together and feeds them values. When the input value is LO, the clear line forces Q to be LO and −Q to be HI. When the input value goes HI, no change appears at Q and −Q. However, D is now HI. When a clock LO-to-HI transition occurs, Q goes HI and −Q goes LO. This

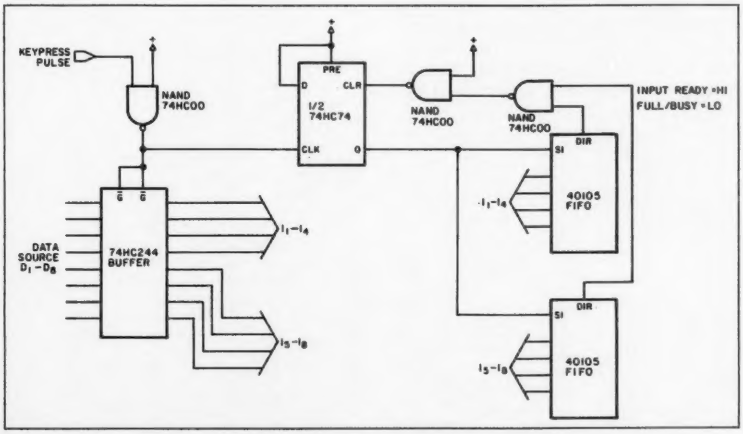
KEYPRESS PULSE
+
NAND 74HCOO
+
PRE
D
CLR
1/2 74HC74
CLK
Q
+
NAND 74HCOO
NAND 74HCOO
INPUT READY = HI
FULL/BUSY = LO
Ḡ
Ḡ
DATA SOURCE D1 - D8
74HC244 BUFFER
I1 - I4
I5 - I8
DIR
SI
I1 - I4
40105 FIFO
DIR
SI
I5 - I8
40105 FIFO

Figure 15. A practical flip-flop controller for a FIFO circuit.

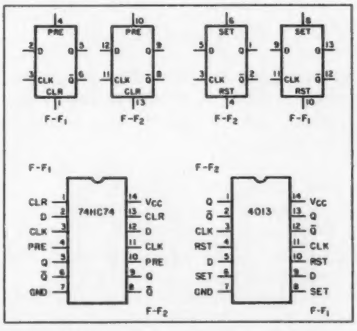
4
PRE
2
D
Q
5
3
CLK
Q̄
6
CLR
1
F-F1
10
PRE
12
D
Q
9
11
CLK
Q̄
8
CLR
13
F-F2
6
SET
5
D
Q
1
3
CLK
Q̄
2
RST
4
F-F2
8
SET
9
D
Q
13
11
CLK
Q̄
12
RST
10
F-F1
F-F1
CLR 1
D 2
CLK 3
PRE 4
Q 5
Q̄ 6
GND 7
74HC74
14 Vcc
13 CLR
12 D
11 CLK
10 PRE
9 Q
8 Q̄
F-F2
F-F2
Q 1
Q̄ 2
CLK 3
RST 4
D 5
SET 6
GND 7
4013
14 Vcc
13 Q
12 Q̄
11 CLK
10 RST
9 D
8 SET
F-F1

Figure 17. Comparative pinouts for the 74HC74 and the 4013.

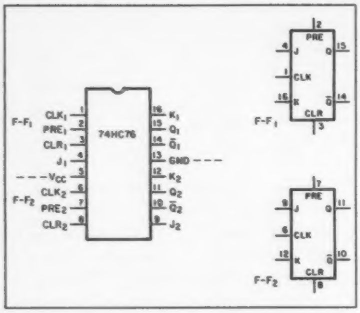

Figure 18. Pinout for the 74HC76 J-K flip-flop.

circuit is useful for controlling operations whenever the user wants to keep the operation going after an input (data and clear) value changes, but he doesn't want it to continue indefinitely. For example, he may feed the data and clear inputs regular pulses that are delayed farther down the line. The clock input may be the delayed pulse. Thus, Q or −Q might enable a certain process from the beginning of the regular pulse through the end of the delayed pulse.

These three circuits add considerable control versatility to the simple debounced switch in Figure 4. In most cases, a user will use signals inside his circuits rather than manual pulsers to control operations. Good practice will let the circuits control themselves wherever possible.

A Matter of Rules

Mastering any of these applications of flip-flops requires only keeping track of the chip's operating rules and priorities. For the 74HC74, the rules are straightforward:

1. The clock requires a LO-to-HI transition.
2. On a clock transition, whatever value D has appears at Q, and its opposite at −Q, if both preset and clear are HI.
3. Preset and clear input LOs override data clocking.
4. A preset LO forces Q to HI and −Q to LO, when clear is HI.
5. A clear LO forces Q to LO and −Q to HI, when preset is HI.
6. Never make preset and clear LO at the same time.

These rules tell what the possibilities are for the flip-flop. It's up to the user's imagination on what to do with these possibilities.

Other flip-flops have similar, but slightly different rules. The following two examples are for the CMOS CD4000-series D-type flip-flop and the J-K flip-flop from the 74HCOO-series.

The CD4013 D-type flip-flop, shown in Figure 17, obeys the following rules:

1. The clock requires a LO-to-HI transition.
2. Whatever value D has appears at Q, and its opposite at −Q, on a clock transition, if both set and reset are LO.
3. Set and reset input HIs override data clocking.
4. A set HI forces Q to HI and −Q to LO, when reset is LO.

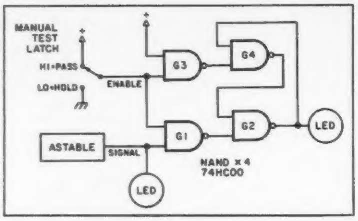

Figure 19. Basic latch circuit using NAND gates.

5. A reset HI forces Q to LO and −Q to HI, when set is LO.
6. Never make set and reset HI at the same time.

Note that the 4013 uses the terms set and reset rather than preset and clear to mark the difference in conditions that actively force values on Q and −Q. Also note that the pinout differs from the 74HC74.

The 74HC76 is a J-K flip-flop, meaning that it has two data input terminals, as shown in Figure 18. Its rules look something like this:

1. The clock requires a HI-to-LO transition.
2. If J is HI and K is LO, then a clock transition will yield Q as HI and −Q as LO, if both preset and clear are HI.
3. If J is LO and K is HI, then a clock transition will yield Q as LO and −Q as HI, if both preset and clear are HI.
4. If J and K are both HI, then clock transition will force Q and −Q to toggle or reverse their values, if both preset and clear are HI.
5. Preset and clear input LOs override J and K data clocking.
6. A preset LO forces Q to HI and −Q to LO, when clear is HI.
7. A clear LO forces Q to LO and −Q to HI, when preset is HI.
8. Never make preset and clear LO at the same time.

The 74HC76 uses a clock transition opposite that of the other two flip-flops featured here. The J and K data inputs offer the possibility of a two-line controlling circuit, as well as the potential for dividing by two by tying both J and K to the positive supply line and feeding the eariler 7555 astable output to the clock input. Every variation among the many available flip-flops offers new possibilities.

In fact, one manufacturer's data book lists 11 D-type flip-flops and eight J-K-type flip-flops. The ones looked at come two to a package, with each flip-flop independent. Some packages, such as the 74HC175 quad D-type and the 74HC78 dual J-K-type, have common clock lines. D-type flip-flops come 4, 6, and 8 to a package, but some have common clear lines and lack the −Q output. How compact the experimenter can make his divider, shift register, or controller may depend on just what input and output lines he wants.

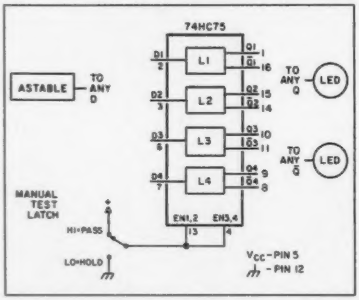

Figure 20. Test latch circuit using the 74HC75.

Latches

The flip-flop is useful because a user can latch into the outputs values that appear only briefly at the inputs. The feedback shown in the basic flip-flop is the key to latching. There are also special ICs called latches. Although associated with flip-flops, they are not true flip-flops. However, latches do use a feedback loop with pass/block gates to freeze the state of a gate whenever the Enable line is set properly. Latches tend to use a slightly different vocabulary from flip-flops, so here are some lessons on how to use latches effectively in circuits.

Every time the user clocks a data value to Q and −Q with a D-type flip-flop, he has latched that value. Without the clock pulse, he block it from passing to the flip-flop output. Latch chips operate in the reverse manner. In an unlatched condition, they pass the input value to the output instantly. Only when placing the correct value on the latch or enable terminal is it possible to hold the output at the value last received. Remember, the value must reach the input before it can be latched.

The experimenter can build a basic latch from a single NAND chip, like the 74HCOO. Figure 19 shows how. Gate 1 looks like the simple pass/block gate used earlier in Figure 3. When the enable line is LO, the gate output is HI, but when the enable line is HI, the signal on its other input line passes (inverted) to gate 2. With enable HI, the inverter (Gate 3) passes a LO to one input of gate 4. That LO forces gate 4 to a HI output, which shows up

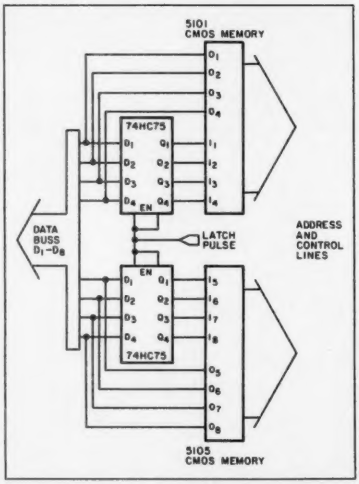

Figure 21. Latch control for memory input signals.

on the other input of gate 2, which in turn allows gate 2 to pass (and re-invert) the signal from gate 1. Under this condition, the output line Q looks just like the data input. When the enable input goes LO, the inverter puts a HI on one input of gate 4, allowing the gate to pass the signal fed back from the output of gate 2. This output will be whatever value gate 2 had when the enable line went LO, since that same LO now blocks signals from passing through gate 1. The gate 1 output stays HI, allowing gate 2 to pass the static signal circulating in the loop from gate 2 to gate 4. The user retains the output value of gate 2 as long as he holds the enable line LO. The condition of the circuit shows itself in the LEDs in Figure 19 as he catches and holds signals with the mechanical switch in the enable line.

He can build most of the circuitry of a latch directly on the IC chip, using only enable and data inputs, along with direct Q (and sometimes inverted −Q) outputs. This allows many latches on a single 14-pin or 16-pin IC. Figure 20 shows a latch circuit using the 74HC75 quad latch. The data input value appears at Q (and its opposite at −Q) so long as the latch input line is HI. When he brings the latch input LO, the Q and −Q outputs remain constant at the level of the last input value, regardless of date input changes. Using the astable pulser as a data source, the test latch uses the same mechanical switch to catch and latch the output before a pulse changes levels.

Latches are useful wherever the user wishes to hold a value temporarily. Figure 21 shows a simplified schematic of a set of latches receiving data in short pulses. However, the latches feed a memory chip that requires a relatively long time to write the data into its cells. (Here, short may mean 10 to 20 nanoseconds, while long means 200 to 300 nanoseconds. They are both short, but the difference is a ratio of ten-to-one.) If he can signal the enable line before the data disappears and hold it LO until the memory has finished writing, the proper data will be present at the memory inputs throughout the write cycle.

> ***"It pays to master the flip-flop for its versatility."***

Latches come in many packages for many purposes. Eight-bit (or octal) latches, such as the 74HC373, are useful for capturing computer and other kinds of parallel codes that do not last long. These latches usually have only the Q output. Once latched, a memory chip or other kind of processor can take the time it needs to do its job. Such chips usually have only one or two latch enable inputs to control all the latches simultaneously. When scanning data books in search of the right latch, be sure to read the rules. Most require a LO to latch, but some (such as the 74HC4511 Latch/Decoder/Driver) need a HI or a LO-to-HI transition. The experimenter may find the latch input called Latch, Enable, Control, or G. Newer chips have tri-state outputs for use on buss lines, so be sure to distinguish the latch control from the output enable or control line. One convention calls the output control OE if it requires a HI for output enable and OD if it requires a HI for output disable.

There are many other chips that use flip-flop and related circuitry, usually in conjunction with gates to perform specialized function. I have noted the 74HC4511, which latches a count, transforms it into signals for a 7-segment display, and provides enough drive to light the LED segments. Many data books show representations of internal circuits reduced to the level of gates and flip-flops. If the digital gate is the most fundamental internal IC circuit, the flip-flop is surely second. But remember that at heart a flip-flop is just a special arrangement of gates.

It pays to master the flip-flop for its versatility. And it pays to keep a data book handy when designing digital circuits. At today's prices, manufacturer's data books are a bargain, whether the tinkerer majors in LS-TTL, CMOS, or high speed CMOS. Once having learned how to decipher the rules for a particular flip-flop, the IC offers a large array of useful circuits and an unending source of experiments.

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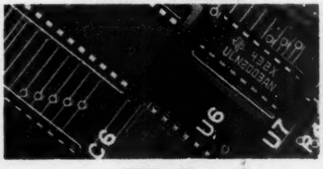

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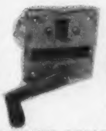

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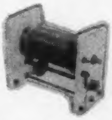

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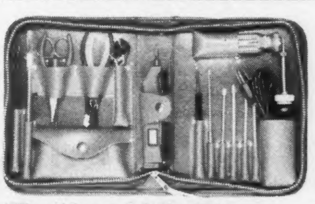

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Tips for Code Class Teachers

by Larry Lisle K9KZT

For some people, learning the Morse code is a real challenge! While many sail through the requirements for Novice, General, and even Extra class tickets with no great difficulty, others have found so much frustration in even passing the five word-per-minute Novice test they gave up and never became a ham.

In this article, I'd like to offer some suggestions for helping students who have a hard time mastering the code.

The Long and Short of It

The initial hurdle in learning the code is telling the dits from the dahs. (For the newcomer, we never speak of the code in terms of dots and dashes, but in short sounds and long, such as, "dit" and "dah.") An instructor, at the end of the first session, usually identifies the faster and slower learners in a group on this basis alone.

The techniques I've found effective in overcoming this problem is to emphasize the difference between the two sounds. Once this has been established, gradually diminish the difference as progress is made.

- Method 1: Make the dahs longer than standard.

The standard dah sounds three times as long as the dit. I've found that sounding the dahs four, or even five times longer than the dit is a great help. This sound is easily accomplished with a hand key, but it's usually easier to change a computer program if using a computer generated code. The dah/dit ratio can even be made part of the menu.

- Method 2: Send the dits and dahs at a different pitch.

By using a keyer paddle and two code oscillators, a different pitch can be made. The code oscillator on the dit side should be at the usual tone of 700 to 1000 Hz and the dah oscillator somewhat lower. Of course, the dits and dahs won't be automatic or self completing, but with practice it's possible to send good code this way. This is a very good way to introduce all students to the code, and and as they progress, the difference in pitch should be reduced.

- Method 3: Involve the other senses.

Some people learn best by what they hear, see, touch, or the motions they make.

To stimulate the visual sense, use a flashing light along with a code oscillator, either for both the dits and dahs, or for just one of them. To involve the sense of touch, let the learner rest his or her fingers lightly on a speaker as the code is sent. The motion or kinesthetic sense is simply a matter of letting the learner send with a straight key or a paddle wired as a sideswiper—dits to the right, dahs to the left, one at a time.

In real problem cases, all of these can be used at once.

For home practice, every student should have either a keyer, a code oscillator, or a buzzer. Also, a student might want to use a tape recorder to record class practice sessions for review or to record their own sending.

Confusing Characters

Confusing opposite letters, such as K and R, E and D,or similar ones, is often a problem.

The best solution is to be careful of the order in which the letters are taught, and not moving on until they are mastered. I've tried

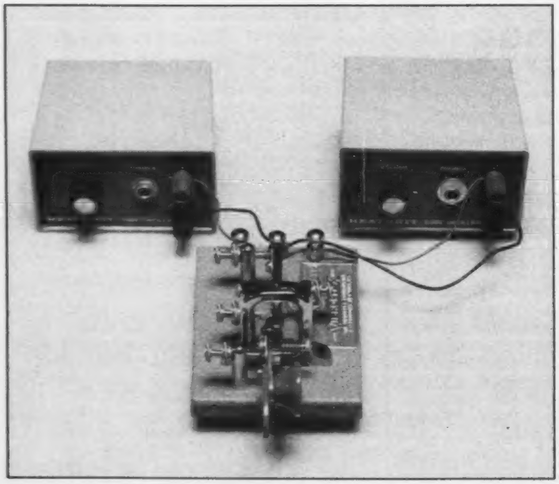

Photo A. Here's a setup for two-tone code. The "dah" oscillator is keyed when the paddle is pushed to the left with a slightly lower pitch than the "dit" tone.

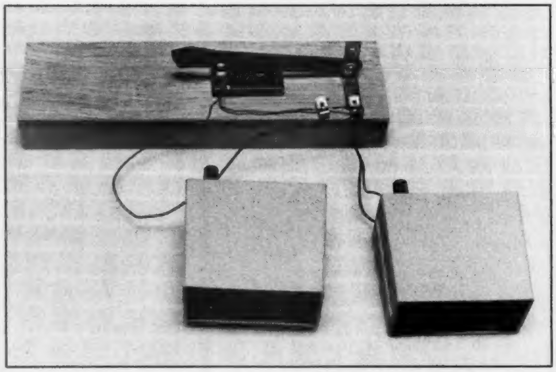

Photo B. Don't have a commercial paddle? Make one from an old knife, switch and some scrap brass.

different orders, but the one I've found most effective is 5 and 0 (to teach the dit and dah sound). I then started with E T A R, S L U Q J, H O N C V, I B Y P, W K Z M, D X F G. This order is from the ARRL publication *Learning the Radiotelegraph Code*. Note that the similar and opposite letters are well separated, but it's possible to send many words even during the first session.

The students should also be warned, in the preliminary instruction, not to learn characters as opposites. If there is a character confusion problem, don't try to treat it by "di-dah is A, dah-dit is N". Instead, re-teach one of the letters along with one letter from another pair with which the student has trouble.

Writing Problems

While many CW operators do most of their copying "in their heads" and make only occasional notes to pass the test, the student should be able to write down everything he or she hears. The instructor should be aware of some of the bad habits students can acquire in writing, and correct them as early as possible.

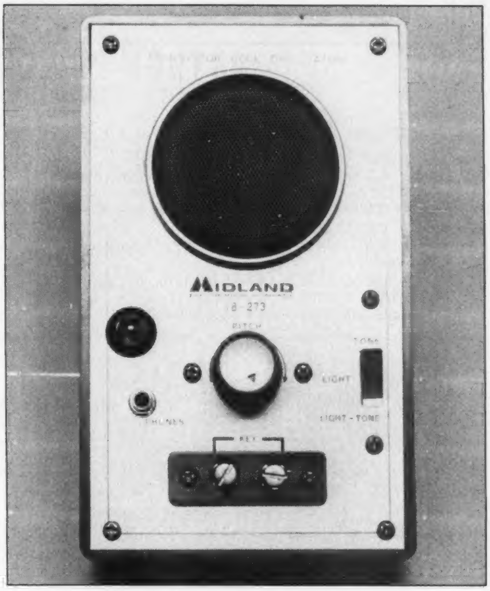

Photo C. Here's an oscillator with a built-in light. "Seeing" the code helps some students.

One of the problems is writing too neatly. Another is writing dots and dashes for letters they're not sure of. And a third is vocalizing the dits and dahs as they are sent. In the early stages of instruction, students start vocalizing when the code is being sent very slowly. They then have to unlearn this as the speed increases. The ideal setup is two instructors: one to send the code, and the other to walk around and see what's happening.

Also, watch for the student who writes vertically down the page instead of across. This might be acceptable for the test since it keeps the student from reading and thinking about what they're copying and from becoming confused, but it won't help them on the air!

Lack of Progress

Sometimes students seem to get "stuck" at a maximum rate. This is called a plateau, a leveling of their learning capabilities. Since it doesn't happen to everyone or perhaps even most people, I don't mention the plateau until it starts to bother a student. Then I just tell him or her that it's normal and not to worry about it. We then sit down and go over their practice copy to see what letters are giving them trouble. I point out that only a few characters need work, and then we emphasize on them in future practices, two or three at a time. Other tricks include sending faster, say at seven or eight words per minute, and then slow down to five words per minute to make it seem easier. End the sessions with easy copy to leave the students on an "up" note. Don't let the student dwell on the idea of the plateau, or they will make it a much bigger problem than it is.

Photo D. The code isn't all hard work! Just ask Matt White KA9VEY.

Test Taking

Some people are not good test takers. There are at least two ways to handle this in teaching the code. The first is to give the students a test when they don't know they're taking one. Counting a routine practice session at five wpm as the test (one minute solid copy), copying a QSO off the air and then casually asking questions will help with testing practices. The only problem with this approach is that they'll be just as nervous during their first QSO as they would be for a test, causing the student to not be able to learn to copy under pressure.

A second way to approach the problem is to tell them that everyone is nervous during a test, but taking a test is seldom fatal. The worst thing that can happen is that they'll have to take it again. (Fortunately, the thirty-day waiting period is a thing of the past!) Then try to get the student almost solid at six or seven wpm and go for it! If they can't, try plan A!

The final decision is up to the instructor, but be careful about hard and fast decisions. There are always exceptions.

Discouragement

It's easy to become discouraged when the student has been working at something for months and still hasn't accomplished it. It's even harder when one student starts with people who took the test the same time and passed it within a month with seemingly little effort. When this happens it's up to the instructor to be a cheerleader, a coach, and a counselor.

Studies have shown no correlation between learning the code and general intelligence or other aptitudes. It's just one of those things like math, sports, art, or cooking, that some people have more natural ability at than others. Show the student the progress he or she *is* making. Tell them tales of people who had even more trouble, but finally made it. Change the practice routine, if the characters were sent fast with long spaces, try the normal rate. Sometimes just a different tone on the code oscillator can make a difference. Try lots of different things. At least it will distract the student from discouragement!

To summarize, a ham code class should be a school without failure! Be positive, be patient, and be flexible. The student only needs to pass the test once.

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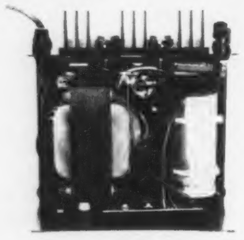

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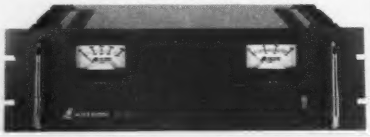

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RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
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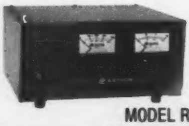
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



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VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

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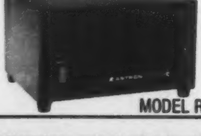

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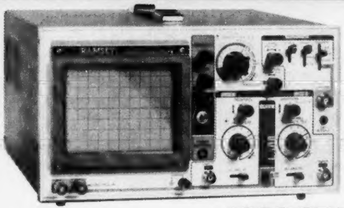

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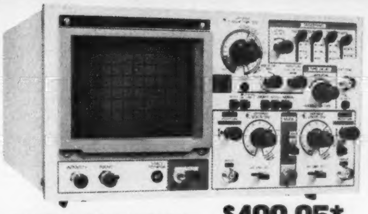

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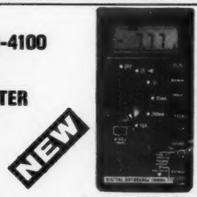

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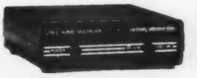

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SECURITY ALERT!

Part 6 in the Tech Nomad Series

by Steven Roberts N4RVE

Here Today, Gone Tomorrow?

Sometimes I have no choice: I must turn my back on the Winnebiko and trust the public to leave it alone. And yes—to answer a frequent question—it usually makes me nervous. For as somebody wrote in a bicycle magazine once, "the best lock is the human eye." Those who drive around with thousands of dollars in ham radio equipment know exactly what I mean: you go downtown, park, have a flash of paranoia, then either stuff everything of value into a suitcase or get a hotel room with a view of the parking lot. . . probably spending the night in half-sleep, jumping up at every sound to see if some criminal is about to become an unlicensed ham.

My problem is even worse. The bike not only has no locks (except for a cable, which is essentially useless), but it also attracts curious people the way a pussycat in heat lures cruising toms. So far, I've been lucky. A few drunks have sat on it and a few kids have flipped console switches, but nobody has actually tried to STEAL it. Perhaps those so inclined have been stopped by the vague realization that they'd never get very far. The average thief would either fall over at the first traffic light or be so overwhelmed by questions from onlookers that he'd give up and go back to anonymous purse-snatching.

But still, I worry. Maggie and I haul our bikes into cramped motel rooms, up steps, and into peoples' houses just so we can sleep at night, since risk-management theory suggests that the probability of a loss multiplied by its severity is the figure to think about. The former may be low, but the latter is astronomical.

Photo A. The Ungo Box security system, which ranges from $140 to $350 depending on configuration, is an essential element for Steve's peace of mind. Contact Techne at 800-227-8875 (US), or 800-637-3366 (CA).

That's why the Winnebiko has a security system.

The Security System

The heart of the people-detector is an Ungo Box, intended for automotive use and made by Techne of Palo Alto, California. Divested of its usual packaging, it takes the form of three circuit boards mounted on standoffs inside the bike's console.

> "... the average thief would either fall over at the first traffic light or be overwhelmed by questions from [illegible]."

The main board houses control logic and the motion sensor, which is an immensely clever device that looks like a mercury switch inside a tightly-wound coil. It's not a switch at all—even the subtlest ripple of the mercury affects the flux density inside a 40 kHz field, which is then amplified and filtered by associated circuitry. I'm told the company's latest model allows discrimination between motion and shock, which lets one reduce falsing from the normal wind-driven resonance of the car.

The second module is a 300 MHz digital receiver, which listens for commands from a key-ring transmitter with a range of about 100 feet. As I'll note in a moment, I can carry the command options quite a bit further via 2-meter FM, but the basic Ungo Box allows the user to arm or disarm the system without physical contact, trigger an auxiliary 12V pull-down control line (such as a door lock or engine starter relay), or immediately sound the alarm in "panic mode."

Finally, there's an 11-meter transmitter that generates a 4-watt tone-encoded signal when told to do so by the control board—or when it detects shock through its own piezoelectric sensors mounted on the bike frame. This is actually a carryover from my pre-Ungo security system, but the company sells a comparable paging product with a range of a few miles.

Three Security Levels

There are basically three responses to a security alert, depending upon software and the position of a hidden switch. The usual mode is page-only: the machine beeps me when someone touches it. Normally I leave the siren off. Its 130 dB wail is enough to seriously alienate anyone nearby (especially if it takes me a while to drop my fork, extract pasta from my beard, dodge waiters and tables, wait for an elevator, and sprint out the door to disarm the thing). But sometimes the siren's acknowledging chirp upon being armed is a good deterrent—that, along with a few blinking lights labeled "security status," lets people know that they should look but not touch.

If the bicycle-control processor is alive, then an additional level of "protection" is added, the efficacy of which is entirely dependent upon the personalities involved. A few weeks ago, a fiftyish woman had the gall to sit on the seat—whereupon the bike made a loud gunshot sound and firmly said, "Please do not touch me!" She leapt up, startled and embarrassed, and apologized to it.

There are . . . three responses to a security alert, depending upon software and the position of a hidden switch."

A heavily made-up friend of hers with a cigarette walked over to see what all the fuss was about, and I couldn't resist: I transmitted a touch-tone command that caused the bike to say, "This is a no-smoking area." The two of them guiltily backed off about ten feet, speculated awhile, shook their heads in bewilderment, and left . . . glancing a few times over their shoulders to make sure it wasn't rolling after them with evil intent.

Unfortunately, it doesn't always work that way. Some people keep touching the bike over and over to hear the Votrax synthesizer talk, realizing quite accurately that there's no bite in the system's level-two bark: "Do not touch, or you will be vaporized by a laser beam . . ." Children, depending upon their sophistication, either respond with delighted glee or flee in terror. "I just wanna buy the part that gets rid of the kids," quipped a Florida ham upon witnessing the latter response at the Orlando Hamcation.

The nice thing about a motion sensor is that it responds to the movement of anything physically connected to it. As such, my trailer is just as protected as the bike—and until we installed an Ungo remote sensor on Maggie's machine, all we had to do was park it in contact with mine.

Coping With False Alarms

OK. Getting beeped when the bike is touched is fine, because it makes it possible to turn my back on the damn thing and think about something else. But the problem is that MOST alarms turn out to be caused by someone wiggling the handlebars ("Oh look, here's how he steers it!"), stroking the seat fabric, or finger-drawing WASH ME in the road dust of my fairing. Neither event is serious enough to warrant *columnist interruptus*. And the last thing I want to do in the middle of a breakfast of champignons is stand on the sidewalk and try to explain, before the omelette cools, what all the switches do.

That was the motivation behind the 2-meter touch-tone link between an HT and the bike.

I have referred earlier in this series to remote control of the speech synthesizer—basically a means of selecting one of a stored repertoire of pre-programmed speech strings via a 20C90 on the 68HC11 I/O bus. Other commands allow direct control of the siren, the flasher, and the security system itself—and originally, I set it up to allow (n) seconds of local audio to be transmitted back to me on demand. The trouble with that, however, is that the language of bystanders does not necessarily adhere to the stylistic standards set forth in Part 97 of the FCC regs . . . specifically those having to do with obscenity. Telling the bike to transmit what it hears on 2-meter simplex is more than a little risky.

So I'm on the lookout now for a good deal on a pair of 49 MHz transceivers, one of which can be PTT'd by remote control and the other of which will live in my "off-bike" package. With the addition of a second packet TNC attached to my laptop computer, I'll be able to sit in a restaurant and carry on a very convincing "live" conversation via the synthesizer. Frivolous?

Not at all. Arthur C. Clarke once noted that "any sufficiently advanced technology is indistinguishable from magic." When the objective is security, a bit of trickery can go a long way toward keeping those of low motives intimidated. And during all those other times—the times of electronic flirting and teasing, intellect-filtering and friend-polling—well, it's FUN. This is exactly what technology should be.

Sneak Preview

While on the subject of additions to the Winnebiko, by the way, I should comment on the effects of visiting such tech-meccas as the Dayton Hamvention, COMDEX, and CES. This is the stuff that fuels the bike, and I suspect it has a lot to do with your motivations in this hobby as well. There's an adrenalin-like rush associated with wandering aisle after aisle of whiz-bang gizmology, especially when one recognizes that behind the sparkling exteriors of all those machines lie exquisite tools for talking, sharing, learning, scoring, playing, and whatever else it is people yearn to do with their free time. In my case, this all translates into wild dreams of the Winnebiko III . . .

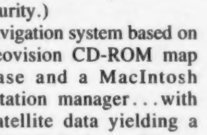
The security system will continue to grow, with a special function that detects a change of latitude and longitude (via GPS and LORAN) without an appropriate password. This will trigger packet beaconing on all available channels, giving a security alert along with precise position data and local recording (with optional transmission) of captured audio.

The bicycle-mobile ham station grows rapidly as we wander from hamfest to hamfest on the frenzied Computing Across America media tour. Bob Heil's 10-meter FM rig . . . an ATV transceiver on 450 . . . an OSCAR station for Phase 3C . . . HF mobile operation from the PV-covered trailer with a thicket of Hustler verticals and handlebar remote control . . . I just hope KA8ZYW will be willing to carry all my clothes and camping gear as the Winnebiko's electronics continue to grow. (I'll emphasize the job security.)

A navigation system based on the Geovision CD-ROM map database and a MacIntosh presentation manager . . . with live satellite data yielding a zoomable "you are here" display on the console. The under-seat trackball will allow linkage to other databases and Hypercard stacks, allowing easy graphic reference to hospitality and business-reference data wherever I happen to be.

An 8-mm video system for both ATV and on-the-road production (with a potential joint venture in the entertainment industry). A DAT recorder. Lots of file space. Automatic surge-hydraulic brakes on the trailer. An adaptive and overridable automatic transmission, driven by torque and speed measurements. Retractable aerodynamic side curtains. Etcetera. But no motor! Gotta keep this cycling life pure.

Cheers from the road, and thanks to all who wandered by our booth at Dayton! Helluva show . . .



To find out more about Steve's high tech nomadic adventures, you can request reprints of parts 1-5 from 73 *editorial offices ($3 for the first one, $1.50 thereafter). Address correspondence and orders for Steve's book,* Computing Across America, *to CAA, 1306 Ridgeway Ave., New Albany IN 47150.*

Care and Feeding of a PBBS

Timely tips for packet bulletin board users (Part II)

by David McLanahan WA1FHB

Disk Files

In addition to mail, the PBBSs offer disk files. What is listed as a message or bulletin and what is carried as a disk file depends on the taste of the system operator, but computer programs, and documents such as the *ARRL Gateway* and the *W5YI Report* are normally carried as disk files, as are reference materials such as system maps.

There are two types of PBBS in use, floppy-disk based and hard-disk based, and this reflects into the organization of the disk files. The floppy-based system will have between one and four "logical" drives and its directory is not usually divided further. **W** will give you this listing, although you can use normal CP/M file type specification to limit the list, i.e., **W *.HEX** or **W DX1?.ARL**, where **?** substitutes for any one character in the filename or extension, and ***** substitutes for any number of characters.

On a hard-disk-based board, however, the files are usually partitioned by the operator into categories—ARRL Bulletins, Network Information, Hardware Hints, etc. Each of these categories is given a letter, and that letter is added to the **W** to obtain that directory. Thus, on most systems, **WA** will list ARRL news, **WB** will show general bulletins, and so forth (see example). These category letters may vary slightly from board to board, but a plain W will give you a listing of them. (see Fig. 8.)

Having found a file of interest, enter **D filename.ext** to get it. (Don't include spaces between the name and the extension, even if they are shown in the directory.) The size of the file, of course, gives an indication of the time needed to send it. If the channel is busy, the download of a 12 kilobyte file will probably fail part way through, and there is no way to get the PBBS to "fill" with only the last third of the file.

There is an important detail on disk files: All of the PBBS's programs and files are held on those disks, and the operator has a switch to "hide" the files he doesn't want made public or downloaded. He may forget to hide a file, however, that should be hidden. If the PBBS user runs across a program with an extension (final three letters following the dot) of COM or EXE, such as **SOMENAME.COM**, he should NOT try to download it. It's an executable command program and, if downloaded, the PBBS may crash.

Uploads and Disk Space

PBBS operators usually welcome the uploading of pertinent files by users if it's done with forethought, but it's wise to check with the operator first. Before doing it, determine the size of the file to upload. Then log on and do a **W** command to check the amount of space available on each disk. Assuming that one of the disks has a LOT more space than the size of the file, do **U B:filename.ext** (where B: is the letter of the disk with much extra space) and send the file, ending it with a **^Z** (Control-Z), just as in ending a message. As with calls, either upper- or lower-case letters are OK. Note the admonition, in Part One, against using telephone modem error-checking protocols with packet.

The reason for special care on the disk space is that the PBBS has two disk files, usually hidden, that expand on their own during normal operation—**LOG.TNC** (the transaction record) and **MAIL.DAT** (the message file)—and if these are properly hidden, the user won't know which drive(s) they are on. If a user loads the disk containing the mail to within 2K of full, and a subsequent forward contains a 3K bulletin, the system will crash, likely destroying the mail file. Of course, the operator is watching for this, but he may be away (unattended automatic operation is legal) and unable to catch it before it's too late.

This space problem is most pressing with the floppy-based systems, which have 480 to 1000 kilobytes on-line space total for everything, but even 10 or 20 megabytes of hard disk can fill eventually. There are lots of files moving between boards now, and the 20 meg hard drives are going to fill even faster when the badly-needed 19.2 kilobaud GLB back-bones are in place within six months or a year.

Hidden Files

There are a number of files, used by the PBBS and usually hidden, that make dull reading if they are found: **LOG.TNC** (a slightly cryptic record of board activity), **CONFIG.TNC** (the file that contains all the "personalization" of that particular PBBS), and **FWD.TNC** (the file with all the forwarding instructions and calls used by the board). **USER.DAT** and **USER.BAK** contain coded information about the board's users. (This is the file that holds, for example, the name that goes with your call and the data on your last check-in.) **MAIL.DAT** and **MAIL.BAK** contain all the mail on the board, again in a very cryptic fashion. **MON.TNC** and **CALLS.TNC** contain lists of stations recently connected or heard. **HELP.TNC** and **INFO.TNC** are the files that the user gets doing the **H** and **I** commands, respectively.

Oops!

Once in a while, through the renaming of a file or a keyboard error, a user may find himself on the receiving end of a nearly interminable transmission. Perhaps he's started a download of a long, interesting BASIC program, but after seeing the first few lines he realizes that he already has it (possibly under a different name) from another board. Or, perhaps, on a board with a current message number of 5280 and 122 messages on-line, he fumble-fingers **L 10** instead of **LL 10** and spots the error when a listing of message 47, filed in 1942, graces the screen.

Once a long transmission has started, the PBBS will not respond to any abort command, nor will it even hear the **B** for goodbye. The user can just go for lunch or a siesta and let 'er perk, but that ties up both the PBBS and the channel (not to mention his own packet station).

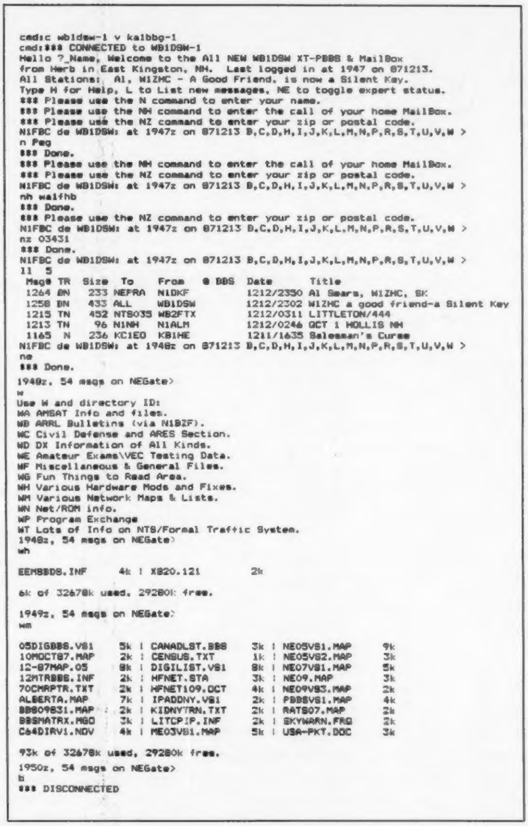
The best solution to this problem is just to disconnect from the PBBS. Once the TNC tells the PBBS that it hasn't anyone to talk to, it will blow out the text in its buffer and reset itself. The other alternative, just turning off the radio, will work also, but the PBBS will continue to retry transmission until it retries out, disconnects, and resets itself. This will take longer, again tying up both PBBS and channel.

Miscellaneous Commands

B, goodbye, (no modifiers) logs off the system politely. Disconnecting will also work, and if the user "goes away" quietly, (i.e., either no acknowledgements or no input) the board gives up after several minutes and resets itself.

J (no modifiers or arguments) gives a timed list of the stations most recently heard on channel and most recently connected to the PBBS. (see fig.9.)

P <call> gives the most recent digipeater path used by <call> to access the PBBS. Note that if <call> is an adjacent PBBS, the path you get may not be the path the board uses for forwarding. Also, if the subject station of the inquiry last connected using NET/ROM, the path shown will be only to the NET/ROM. If the nearest NET/ROM is adjacent to the PBBS, any station using it will show up as a "direct connection" in response to the P command.



```
cmd:c wb1dsw-1 v ka1bbg-1
cmd:*** CONNECTED to WB1DSW-1
Hello ?_Name, Welcome to the All NEW WB1DSW XT-PBBS & MailBox
from Herb in East Kingston, NH.  Last logged in at 1947 on 871213.
All Stations:  Al, W1ZHC - A Good Friend, is now a Silent Key.
Type H for Help, L to List new messages, NE to toggle expert status.
*** Please use the N command to enter your name.
*** Please use the NH command to enter the call of your home MailBox.
*** Please use the NZ command to enter your zip or postal code.
N1FBC de WB1DSW: at 1947z on 871213 B,C,D,H,I,J,K,L,M,N,P,R,S,T,U,V,W >
n Peg
*** Done.
*** Please use the NH command to enter the call of your home MailBox.
*** Please use the NZ command to enter your zip or postal code.
N1FBC de WB1DSW: at 1947z on 871213 B,C,D,H,I,J,K,L,M,N,P,R,S,T,U,V,W >
nh wa1fhb
*** Done.
*** Please use the NZ command to enter your zip or postal code.
N1FBC de WB1DSW: at 1947z on 871213 B,C,D,H,I,J,K,L,M,N,P,R,S,T,U,V,W >
nz 03431
*** Done.
N1FBC de WB1DSW: at 1947z on 871213 B,C,D,H,I,J,K,L,M,N,P,R,S,T,U,V,W >
ll  5
 Msg# TR  Size  To     From    @ BBS  Date      Title
 1264 BN   233 NEPRA  N1DKF           1212/2350 Al Sears, W1ZHC, SK
 1258 BN   433 ALL    WB1DSW          1212/2302 W1ZHC a good friend-a Silent Key
 1215 TN   452 NTS035 WB2FTX          1212/0311 LITTLETON/444
 1213 TN    96 N1NH   N1ALM           1212/0246 QCT 1 HOLLIS NH
 1165  N   236 KC1EO  KB1HE           1211/1635 Salesman's Curse
N1FBC de WB1DSW: at 1948z on 871213 B,C,D,H,I,J,K,L,M,N,P,R,S,T,U,V,W >
ne
*** Done.
1948z, 54 msgs on NEGate>
w
Use W and directory ID:
WA AMSAT Info and files.
WB ARRL Bulletins (via N1BZF).
WC Civil Defense and ARES Section.
WD DX Information of All Kinds.
WE Amateur Exams\VEC Testing Data.
WF Miscellaneous & General Files.
WG Fun Things to Read Area.
WH Various Hardware Mods and Fixes.
WM Various Network Maps & Lists.
WN Net/ROM info.
WP Program Exchange
WT Lots of Info on NTS/Formal Traffic System.
1948z, 54 msgs on NEGate>
wh

EEMBBDS.INF     4k | X820.121        2k

6k of 32678k used, 29280k free.

1949z, 54 msgs on NEGate>
wm

05DIGBBS.V81    5k | CANADLST.BBS    3k | NE05V81.MAP     9k
10MOCT87.MAP    2k | CENSUS.TXT      1k | NE05V82.MAP     3k
12-87MAP.05     8k | DIGILIST.V81    8k | NE07V81.MAP     5k
12MTRBBS.INF    2k | HFNET.STA       3k | NE09.MAP        3k
70CMRPTR.TXT    2k | HFNET109.OCT    4k | NE09V83.MAP     2k
ALBERTA.MAP     7k | IPADDNY.V81     2k | PBBSV81.MAP     4k
BBS09831.MAP    2k | KIDNYTRN.TXT    2k | RATS07.MAP      2k
BBSMATRX.MGO    3k | LITCPIP.INF     2k | SKYWARN.FRQ     2k
C64DIRV1.NOV    4k | ME03V81.MAP     5k | USA-PKT.DOC     3k

93k of 32678k used, 29280k free.
1950z, 54 msgs on NEGate>
b
*** DISCONNECTED
```

Figure 8. A sample first connect with a new board. After being greeted, the user entered her name (N), home PBBS (NH), and postal zip zone (NZ). She then listed the last five messages (LL5) and used (W) to get the list of file directories. After reading two of these directories with WH and WM, she signed off with the B command.

T (no modifiers or arguments) lets the user talk to the system operator if he or she is available. Unfortunately, the Xerox 820-I used by many PBBSs wasn't originally fitted with a bell, so unless one has been added, the operator has to notice the request on the local PBBS screen. If the operator does not respond within a minute, the PBBS times out, suggests to the user that he leave a message, and returns him to the normal command mode.

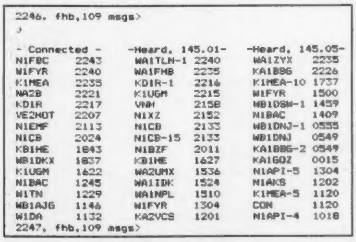
Forwarding

One of the cleverest parts of the W0RLI PBBS operation is the automatic message forwarding. If the system is working right, a user can place a message on his local PBBS for someone outside the immediate area, and it will automatically travel to the other user's local or home board.

No, PBBSs don't have a complete, continually-updated call book on line. Forwarding can be handled in two ways. One way is through the "local user." Each ham on packet announces to the operator of a local PBBS of his choice that he'd like to be considered a local user at that station. (This means an explicit message to the operator—a user just logging on and entering his name does not automatically become a local user.) Periodically that PBBS operator then sends "local user lists" to other boards in the area (and, of course, receives local user lists from them for inclusion in his forward file).

Now, this can work only within a reasonable area. For example, New England PBBSs cannot be expected to keep local user files for the West Coast or even for all of New England, particularly with all the new users coming on.

The second scheme—the @ ("at sign") notation—is rapidly becoming more widespread and puts the monkey on the back of the user. This scheme is a bit like knowing and using a telephone area code. When entering the address call, the user follows it with **@ W0RLI** or **@ KD1R**.



```
2246. fhb,109 msgs>
j

- Connected -     -Heard, 145.01-   -Heard, 145.05-
N1FBC     2243     WA1TLN-1 2240     WA1ZYX    2235
W1FYR     2240     WA1FHB   2235     KA1BBG    2226
K1MEA     2235     KD1R-1   2216     K1MEA-10  1737
NA2B      2221     K1UGM    2215     W1FYR     1500
KD1R      2217     VNH      2158     WB1DSW-1  1459
VE2HOT    2207     N1XZ     2152     N1BAC     1409
N1EMF     2113     N1CB     2133     WB1DNJ-1  0555
N1CB      2024     N1CB-15  2133     WB1DNJ    0549
KB1HE     1843     N1BZF    2011     KA1BBG-2  0549
WB1DKX    1837     KB1HE    1627     KA1GOZ    0015
K1UGM     1622     WA2UMX   1536     N1API-5   1304
N1BAC     1245     WA1IDK   1524     N1AKS     1202
W1TN      1229     WA1NPL   1510     K1MEA-5   1120
WB1AJG    1146     W1FYR    1304     CON       1120
W1DA      1132     KA2VCS   1201     N1API-4   1018
2247, fhb,109 msgs>
```

Figure 9. The "J" list—a log of recent activity noted by the PBBS.

Specification of an @ **<PBBS>** on a message takes precedence, for that one message, over an entry in forward files. Thus, if N1FBC, a regular user at WA1FHB in Marlow, NH, is visiting in Syracuse, NY, (a suburb of Liverpool), a message addressed to **N1FBC @ N1BCK** will go to the N1BCK PBBS in Liverpool, regardless of forward file entries along the way that would normally send an N1FBC message to Marlow, NH.

The actual forwarding process depends on a personalized (for each PBBS) file usually titled FWD.TNC. This file starts off by sending parameter adjustment commands to the TNC. For example, as forwarding can be disruptive to other channel activity, most PBBS operators increase **DWAIT**, the time for the TNC to wait after the channel clears before it will transmit. This gives priority to keyboard users and to PBBSs that are dealing with keyboard users (as opposed to another PBBS that is forwarding).

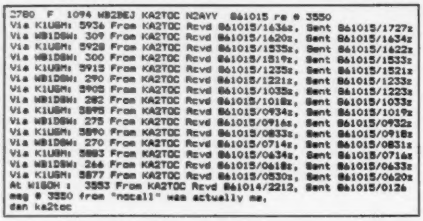
The file then specifies the port (for a multiport system), the time span over which to forward, the call of the destination PBBS, and the digipeater string to use, followed by an addressee list for that PBBS. This list will have both calls of other PBBSs and users, as well as other types of addresses, such as NTSME (National Traffic Service, Maine) or MAPRA (Mt. Ascutney Packet Radio Association).

The time-span setting for forwarding is important to prevent QRM and spinning wheels. If a PBBS attempts to forward during a usually busy time (such as just after many of the users get out of work), the forwarding clutters the channel for them, making normal activity difficult. Into the bargain, the actual forward will likely fail because of collisions anyway, particularly if it's a long message or a multi-hop path.

Forwarding Delays

There are a number of causes for delay in the forwarding of messages. If a PBBS suspends forwarding between 1600 and 2359 local and a user drops in a message after his 15XX forward session, obviously nothing is going to happen until the forward after midnight, and that one's apt to be a bit of a zoo with all PBBSs trying to move the accumulation of eight busy hours.

The nature of the programming is that the PBBS must be clear (i.e., on-line with no user logged on) for at least a part of its forwarding minute. It will then commence the routine and call the first of the PBBSs whose traffic it holds. Unless alternate paths are provided, a single busy from the called PBBS and the program is all done with that station for that forwarding period. Likewise, if the TNC retries out. Unless there are other instructions in the forward file, there will be only one try per PBBS. Thus, the destination PBBS being busy, even for only part of a minute, prevents the forward and delays the message another hour.



```
2780  F  1094 WB2BEJ KA2TOC N2AYY  861015 re # 3550
Via K1UGM: 5936 From KA2TOC Rcvd 861015/1636z, Sent 861015/1727z
Via WB1DSW: 309 From KA2TOC Rcvd 861015/1620z, Sent 861015/1634z
Via K1UGM: 5928 From KA2TOC Rcvd 861015/1535z, Sent 861015/1622z
Via WB1DSW: 300 From KA2TOC Rcvd 861015/1519z, Sent 861015/1533z
Via K1UGM: 5915 From KA2TOC Rcvd 861015/1235z, Sent 861015/1521z
Via WB1DSW: 290 From KA2TOC Rcvd 861015/1221z, Sent 861015/1233z
Via K1UGM: 5905 From KA2TOC Rcvd 861015/1035z, Sent 861015/1223z
Via WB1DSW: 282 From KA2TOC Rcvd 861015/1018z, Sent 861015/1033z
Via K1UGM: 5895 From KA2TOC Rcvd 861015/0934z, Sent 861015/1019z
Via WB1DSW: 275 From KA2TOC Rcvd 861015/0916z, Sent 861015/0932z
Via K1UGM: 5890 From KA2TOC Rcvd 861015/0833z, Sent 861015/0918z
Via WB1DSW: 270 From KA2TOC Rcvd 861015/0714z, Sent 861015/0831z
Via K1UGM: 5883 From KA2TOC Rcvd 861015/0634z, Sent 861015/0716z
Via WB1DSW: 266 From KA2TOC Rcvd 861015/0618z, Sent 861015/0633z
Via K1UGM: 5877 From KA2TOC Rcvd 861015/0530z, Sent 861015/0620z
At W1BOH :  3553 From KA2TOC Rcvd 861014/2212, Sent 861015/0126
msg # 3550 from "nocall" was actually me,
dan ka2toc
```

Figure 10. An example of message forwarding "ping-pong. K1UGM's forwarding file showed the path to the N2AYY PBBS as being through WB1DSW, while WB1DSW's file showed it through K1UGM. This one took place over a span of about 11 hours.

Now, using a forward file set up as mentioned earlier, and having had no luck with the distant station, the board will try the one next closer and, if it bombs out on that, one closer still. Obviously, the further a signal can go on one hop, the faster the service and the less QRM, but the shorter hops are more certain.

There's a more serious source of delay that can often account for a day or more. There is no authoritative list of PBBSs. They are increasing in number almost as rapidly as packet users. Thus, most operators do not try to include all PBBSs in their forward files. They include only the ones their users are apt to need.

If a user enters a message with a new @ W1ABC on a board that hasn't seen that call before, it'll just sit until the operator notices it, looks it up, and adjusts his forward file. Of course, if the PBBS is unknown to his operator the user may be out of luck, especially now that the zone numbers in ham calls no longer relate to station location. This is a problem especially around holidays and vacation time, when visitors from out of the area are attempting to communicate with home. If a user sends messages to distant points, it's helpful to put the destination town and state in the message title to assist the PBBS operators along the way.

To understand the reason for the creation of duplicates, let's look at the actual details of the forward. First, the forwarding station attempts a connect with the desired recipient. If the connect succeeds, the TNC gets (and reports to the computer) the connect message. This is followed by the recipient's prompt line, ending with the "greater than," >, and a return. On seeing this, the forwarding PBBS sends **S W1XXX <return> message title <return>**, and waits. **Enter title for message** is received and ignored. The board waits for **Enter message...it will be number 1234.** When it sees that, it starts sending the message.

At the downstream end, the receiving PBBS starts stacking the incoming packets in a temporary storage buffer. Assuming the "acks" keep coming, the forwarding station continues to the end of the message and its all-important **^Z**. Having sent that, it waits for a new command prompt to tell it that the forwarding of the message was completed successfully. In the meantime, the receiving station is scanning each packet for the **^Z**. When it is found, the message goes from temporary to permanent storage and the command prompt is sent to the forwarding station.

Now, if Murphy, knowing its importance, makes off with that **^Z** packet (and it still doesn't get through with retries), the forward fails, the temporary message (that might be complete or nearly so) is discarded, and the sending board tries again the next hour.

Suppose, however, the ^Z makes it, but the return command prompt gets lost (when an adjacent PBBS starts a file dump, for example). The receiving station has stored the message and is satisfied. The sender, though, still considers the forward as having failed, and will try again next hour. The next try may not follow the same path as the first, but should ultimately result in a duplicate at the receiving station.

PBBS operators try to be on their guard against this sort of thing, but duplicates can often be autoforwarded out within 10 to 20 minutes of their receipt, and some PBBS operators persist in the un-ham-like habits of eating, sleeping (or even going to work) without keeping an alert eye on the screen.

Ping-Pong

Putting together and maintaining a good forward file is quite a chore and every once in a while a PBBS operator will goof. Remember, too, the confusion resulting from the fact that the zone numbers in a call no longer reflect geographical location. Sometimes there is a situation where PBBS A thinks an addressee is to the west (beyond PBBS B), but PBBS B thinks the same addressee is to the east (beyond PBBS A). On a good night such a message can make the trip back and forth between A and B a dozen or more times!

Lost Messages

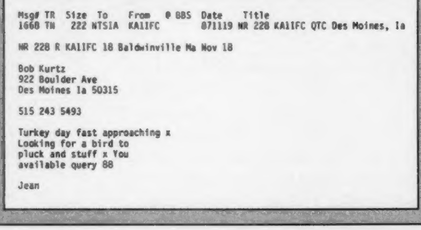
Sad to say, not all messages ever make it to their destination, and there are a lot of places that the wayward ones wind up. Of course, misaddressing (transposition of characters or confusion between zero and letter O, and between number 1 and letter I) are often caught by operators, but still take their toll. Lacking forwarding instructions, messages often languish on boards until the operator tires of seeing them and kills them (often after a month). Some messages are eliminated in error by operators cleaning up "dead wood" on the board.

Traffic Handling and NTS

The subject of message forwarding leads directly into formal traffic handling and the National Traffic Service. Now, I'm not a real "traffic person," but I believe that all hams have a moral obligation to honor the commitment made by our NTS brethren in this area. Many PBBSs are either operated by

Format for an NTS Message (Radiogram) on Packet

The third line from the top is the header line, which follows standard NTS practice. Following NR (number) is the sender's message number. Next is a space to give handling instructions (optional)—"R" stands for "routine". The handling instructions are not used in this message (see ARRL NTS literature for details.) Following that is the sender's call. The free-standing number is the word count of the text, not counting the signature. the town of origin and date of filing follow. Double carriage returns separate the sections of the message (equivalent to $\overline{BT}$ on CW or "Break" on voice). No parentheses or dashes are included in the telephone number.



```
Msg# TR  Size To    From  @ BBS Date   Title
1668 TW   222 NTSIA KA1IFC        871119 NR 228 KA1IFC QTC Des Moines, Ia

NR 228 R KA1IFC 18 Baldwinville Ma Nov 18

Bob Kurtz
922 Boulder Ave
Des Moines Ia 50315

515 243 5493

Turkey day fast approaching x
Looking for a bird to
pluck and stuff x You
available query 88

Jean
```

NTS people or have made arrangements with local NTS people to have the board covered and to see that NTS messages are either delivered or passed off to voice/CW nets for delivery.

Should your local board not have such coverage, do something! Don't let a message addressed to NTSNH or NTSOR sit on a board and gather dust. It's every ham's responsibility!

Caveats

Packet operators seem about equally divided between hams who've gotten on packet and computer operators who've gotten their ham licenses, and many of the latter are unfamiliar with the concept and regulation of "third-party traffic." Basically, third-party traffic is any message to or from anyone (amateur-licensed or not) who is not participating in a QSO. Of course, about 110% of all PBBS operation is third-party. Third-party traffic is specifically forbidden within many countries (such as the United Kingdom of Great Britain) and between ANY two countries, unless a third-party traffic treaty between those countries is in effect.

Because the United States, Canada, and Mexico specifically allow third-party traffic within their respective countries and there is a third-party treaty in effect between them, we tend to forget that this is the exception, not the norm. (Almost all of Europe is off limits, for example.) Using the PBBS network to try to forward any kind of meassage out of the country is a definite no-no, unless a third-party agreement exists.

> ***"Many PBBSs . . . are operated by NTS (National Traffic Service) people . . ."***

Also be aware that the PBBS software is mature, and Hank Oredson W0RLI, the computer wizard who wrote it, and the others who maintain it try to keep the commands constant in the face of program improvement. The release of version 9.8 was widely heralded as the ultimate and perfect end of a long evolution. We are now using version 12.0 of the original code and C-language versions have been released. The W0RLI C code (which can be "ported" from one type computer to another) is now up to vers. 6.05, and several other programmers have had C-language PBBS code up and running at numerous sites for a long time. The PBBS programs will no doubt continue to evolve, causing minor differences in the command structure.

Kudos

On the subject of program writing and ongoing support, a bow is due in Hank's direction for both the excellence of the program and its documentation, and for the attention and care he gives both the program and the network that uses it. Without his efforts, packet would not be where it is today. ■

Dave Mc Lanahan WA1FHB has been on packet for several years and currently runs a PBBS using a call issued by a local CB store. He is presently studying for his FCC Novice license. He is also an optical engineer and physicist, a Certified Flight Instructor, and a nationally registered Emergency Medical Technician. He may be reached at PO Box 17, Marlow NH 03456, or @ WA1FHB.

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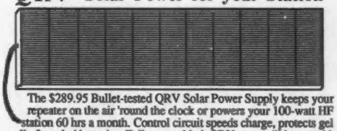

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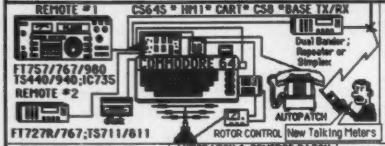

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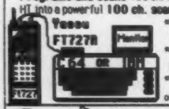

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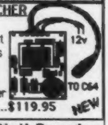

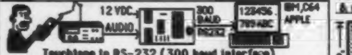

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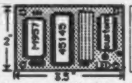

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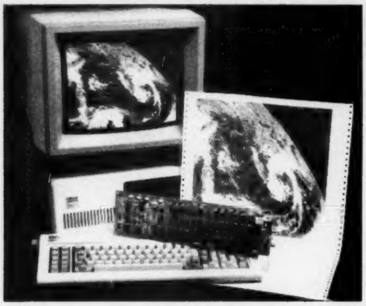

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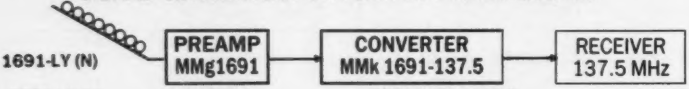

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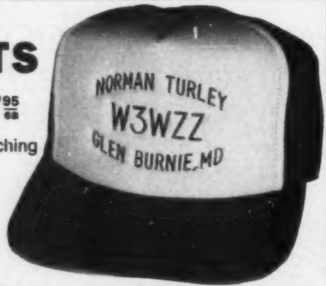

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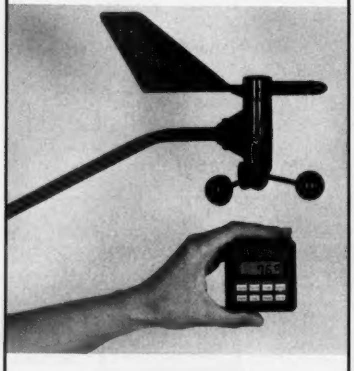

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SCAN CONVERTER SOFTWARE

By describing the basic software features of my *WSH** scan converter, I will answer quite a few questions at once. It is an appropriate time to treat the subject since the current release, Version 5.0, will be the last major upgrade of the software. Version 5.0 does just about anything one might want as the central element of a satellite receiving system.

An EPROM inside the converter contains the software. The software represents approximately 6K of pure machine code.

The preferred method of booting the software is the use of a front panel BOOT switch. When this switch is ON, the software will boot automatically when the power is applied to the host Color Computer. Even though the scan converter is connected to the system, the computer will come up in BASIC. Once the power is applied, the user can run tracking programs of any other application with the switch OFF. With the scan converter running, if the BOOT switch is turned OFF and the computer RESET switch is pressed, the system will drop out of the scan converter software and back into BASIC without altering any image data in memory. This lets the user run any other BASIC or machine language programs for playing with the image. Getting back into the scan converter program is a simple matter of simply turning the BOOT switch ON!

The software is all menu driven and requires only single keystrokes to activate features on individual menus. One use, for example, is the <ENTER> key. It is not required and the computer ignores keys that are not included on the menu options. When the software is called, a grayscale is passed to the display system and the Main Menu is available (see Menu 1).

Options 1–6 are all imaging modes for loading images, either directly from the station receiver, or from the audio tape deck. When one of these modes is selected, the Load Menu will appear (see Menu 2).

All the modes are listed in the left-hand column and the one the user selects will be indicated by a small token posted next to the selection. The image status column is used to provide an indication of the status of the load operation. When an image is being loaded, there is no effect on the image currently on display, since the new image will not be passed to the display until it is complete. This is a nice feature, since the user does not spend time staring at a display where a new image is gradually overwriting the old one! The <CLEAR> key can be used to exit a load operation at any time and return the user to the Main Menu.

AUTO WEFAX is the "standard" WEFAX mode and is completely automatic. Loading of a new picture only begins with detection of a start tone and all timing and phasing operations are automatically performed. As the system goes through the various start, phase, and load operations, the status will be posted with token indicators in the IMAGE STATUS column. The status indicator will indicate WAIT in the interval between WEFAX transmissions. In effect, this mode operates as a WEFAX bulletin board, where the monitor is always displaying the latest image. When I am not using the system for other modes, I keep it in the WEFAX mode where it gives me the latest WEFAX image with no attention on my part.

```
METSAT DISPLAY PROGRAM
  VER. 5.0 ©1987
DR. RALPH E. TAGGART

     —MAIN MENU—
1—AUTO WEFAX   6—120 LPM
2—QUAD WEFAX   7—DISPLAY
3—NOAA VIS     8—MED RES
4—NOAA IR      9—PHASE
5—240 LPM      0—FAX OUT
   KEY IN SELECTION...
```

Menu 1.

```
METSAT DISPLAY PROGRAM
  VER. 5.0 ©1987
DR. RALPH E. TAGGART

      —LOAD MENU—
AUTO WEFAX   IMAGE STATUS
NOAA VIS        WAIT
NOAA IR         START
240 LPM         PHASE
120 LPM         LOAD
USE <CLEAR> KEY TO EXIT...
```

Menu 2.

QUAD WEFAX is basically the option discussed last month. It functions like AUTO WEFAX in many respects except that it takes in four quad transmissions and merges them to reconstruct the image of the entire earth disk. The token posted next to AUTO WEFAX will contain a <Q>, to indicate that it is the quad mode which is operating while the LOAD indicator (status column), will include a number (1–4) to indicate which frame is currently being loaded. While AUTO WEFAX will continue to load frame after frame, until the user exits, QUAD WEFAX will return to the Main Menu when the earth disc is complete.

Variable Line Speeds

NOAA VIS and NOAA IR are routines to produce full-frame display of TIROS/NOAA visible and IR data respectively. When either mode is selected, the status column will indicate PHASE, followed by LOAD after phasing has been accomplished. Once 768 lines of image data have been loaded, the picture will be passed to the display and the system will return to the Main Menu.

```
METSAT DISPLAY PROGRAM
  VER. 5.0 ©1987
DR. RALPH E. TAGGART

—MEDIUM RESOLUTION MENU—
1 2 3  SELECT DESIRED QUAD
4 5 6  USE <0> FOR MAIN
7 8 9  MENU
```

Menu 3.

```
METSAT DISPLAY PROGRAM
  VER. 5.0 ©1987
DR. RALPH E. TAGGART

 —HIGH RESOLUTION MENU—
1 2 3     SELECT      1 2 3
         QUAD—USE
4 5 6    <0> FOR      4 5 6
          MEDIUM
7 8 9   RESOLUTION    7 8 9
       < MR     HR >
```

Menu 4.

```
METSAT DISPLAY PROGRAM
  VER. 5.0 ©1987
DR. RALPH E. TAGGART

      —FAX MENU—
1—WEFAX RECORD/TRANSMIT
2—SMARTFAX (FULL FRAME)
3—SMARTFAX (HIGH RES)
4—SMARTCRT DISPLAY
5—ALDEN WEATHERCHART
KEY IN SELECTION (0 TO EXIT)...
```

Menu 5.

A 240 lpm scan rate can be used for manual display of WEFAX images but is intended primarily for advanced COSMOS display. The 120 lpm mode can be used for either side-by-side display of NOAA visible and IR display or for 120 lpm Soviet METEOR display. Neither of these routines incorporates automatic phasing since they are designed as general-purpose modes. Both will display the image and return to the Main Menu after 768 image lines have been loaded and the image can be phased using the Main Menu PHASE option.

When the system returns to the Main Menu from any of the imaging modes, the image in memory (and on display) is "frozen" and available for manipulation by other Main Menu options. DISPLAY is the simplest of these. It allows the user to recover the full-frame display of the image in memory if they have been playing with the Medium or High Resolution options.

The MED RES or Medium Resolution option is the user's gateway to the ultimate in image detail. Although the display is limited to 256 lines with 256 pixels/line and 16 grayscale values, the image in memory has 768 lines with 1024 pixels/line. If effect, the 256 x 256 display can be used as a "window" that can be used to "zoom" into the high resolution image in memory. When the MED RES option is selected, the Medium Resolution Menu is presented (see Menu 3).

This menu gives the user the opportunity to select any one of 9 overlapping quadrants of the full frame image. Any one of which will represents about ¼ of the entire image area and twice the resolution of the full-frame display. Selection of one of these quadrants (1–9) will result in the display of that quadrant and the posting of the High Resolution Menu (see Menu 4).

The selected Medium Resolution quad will be indicated on the display to the left, while the display to the right represents one of nine possible high resolution subsets of the Medium Resolution image currently displayed. Each time the user enters the number of one of these quads, the high resolution image will be displayed and the selected high resolution quad will be indicated on the left side of the menu.

To select another medium resolution quadrant, the user would use <0> to return to the Medium Resolution Menu. To freeze the current high resolution image, the <0> key would be used from the Medium Resolution Menu to exit to the Main Menu. Each high resolution image has twice the resolution of the medium resolution image and represents about ¼ of the area of the medium resolution display.

The Main Menu PHASE option is used to properly phase an image that has been loaded using the 240 or 120 lpm routines. Phasing is accomplished by moving the entire block of image data (380K) in to memory. Having the display oriented properly, all the other display options will continue to display the image in the same way.

The final Main Menu option is the FAX OUT routine and, if selected, will cause the Fax Menu to be displayed (see Menu 5).

Fax Output

This menu provides a whole range of FAX output options to archive the pictures. It takes advantage of the fact that the image in the computer memory is essentially at full-resolution. Regardless of its original source, the WEFAX RECORD/TRANSMIT options outputs the image in memory in the WEFAX format where it can be recorded on tape or transmitted over a phone line or radio link. This provides a very nice method for storing pictures on a file tape since, on playback, the AUTO WEFAX option can be used for an automatic review of all recorded images. This option requires a very simple interface that will be described next month.

The SMARTFAX options all use the very simple FAX recorder described in the WEATHERSAT column for September and October of 1987. The full-frame options prints the entire picture while the high resolution option will print the last high resolution quadrant displayed from the High Resolution Menu. In effect, either option can be used to obtain a permanent fax printout in just a few minutes.

The SMARTCRT option does for CRT display what SMARTFAX does for FAX. The display terminal, to be described in two months, is much simpler than a dedicated CRT display, and it is useful for getting high quality photographic prints from the image in memory.

The ALDEN option provides base band video output to the Alden Weatherchart Fax recorder, reviewed in the October 1987 issue of *73 Magazine*. Although this recorder is designed strictly for 120 lpm weatherchart display, the computer can format the image in memory to provide for quality printing on this machine (see an example in the October 1987 WEATHERSAT column).

Test Routines

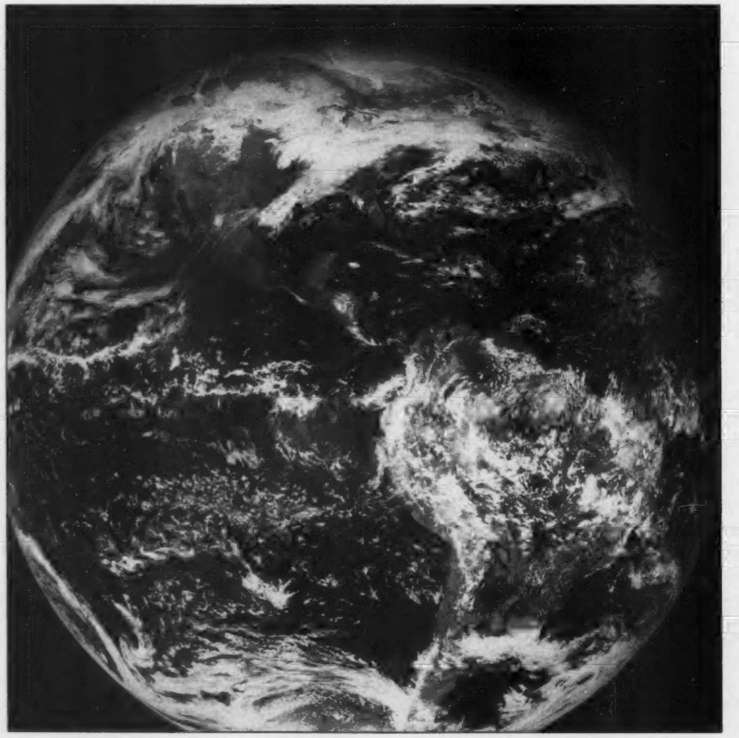
Although not listed on the Main Menu, two additional useful routines are buried in the software and accessible when occasionally needed. The first of these is a digital oscilloscope display which is enabled with the use of the period (<.>) key from the Main Menu. When activated, this routine clears the CoCo screen and displays an oscilloscope-like display of the video levels at the computer input. This display represents a 500 msec interval (one METEOR or NOAA line or two WEFAX lines) and lets the user do a precision job of setting video contrast for optimum display without the use of an external oscilloscope. Use of the <CLEAR> key will restore normal Main Menu display and the "scope" routine will not alter any image data in memory.

The second "buried" routine, activated by using the slashbar (</>) key from the Main Menu, will cause a grayscale to be passed to the video display. This is the same grayscale posted on power up and is useful for optimizing monitor brightness and contrast, as well as setting the proper f-stop for photographing the TV monitor display. Since this grayscale is generated by the computer, it does not alter image data in memory and the original image can be re-displayed using the Main Menu DISPLAY option.

Future Developments

At the start of this discussion, I noted that there would be no future upgrades of this particular software package. Some future developments are in store. A disc version of this same software package for the CoCo is presently being debugged. The program has all the features noted here with the addition of the ability to save and load images from disc. This will be a floppy-based approach for reasons of cost effectiveness. Since each image represents 380K of data, a hard disk would seem ideal for bulk storage. Unfortunately, a 10 meg hard disk will only hold about 26 pictures and will set the user back $400–500 or more for a CoCo compatible drive and controller. In contrast, a complete double sided floppy system will cost less than $200. Although each disk will store only one image, at less than $1 per disk, a $400 investment will let the user store 200 images! Actually, of course, there is no upper limit to the number of floppy disc images the user can file away. Regardless of the number in question, it is far cheaper to do it with floppies, not to mention the fact that a drive crash will not destroy the entire file of images.

Picture of the Month



This marvelous image was pulled from my files, having originally been supplied by Bob Popham at NOAA. This image was obtained at 18:35Z on 11 February 1975. It represents the first image from SMS-2 (*S*ynchronous *M*eteorological *S*atellite), the prototype for our present GOES system. It was the pictures such as this, that spurred many of us to make the difficult transition from VHF to S-band (1691 MHz), something we take for granted today!

**References to* WSH *refer to the Third Edition of the* Weather Satellite Handbook, *available from WB8DQT at $15.00 per copy. Outside of the U.S., please include an additional $1.00 for postage.*

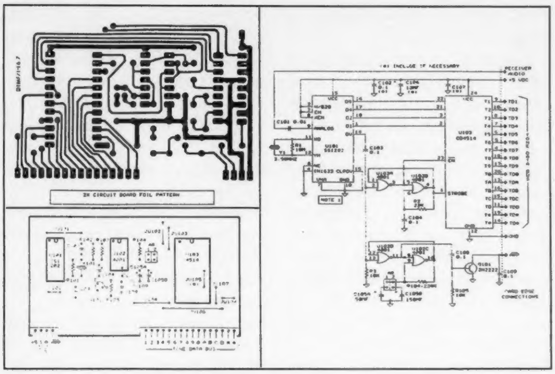


Figure 12. DTMF 1–16 decoder module.

Continued from page 29

Near the trace junction of U102 pins 3 and 5, cut ⅛″ from the foil trace connection between this junction and U103 pin 1. Leave trace connection between U102 pins 3 and 5.

Prepare two, ⅜″ small insulated wires. (#30 wire-wrap or equivalent) by stripping 1.16″ insulation from each end. Carefully tin each end with solder. Tin each end of the foil traces with solder.

Connect one of the wires from U103 pin 1 trace to U104 pin 4. Leave IC socket pin hole open for later installation of IC socket. Connect the other insulated wire from U103 pin 23 trace to U102 pin 5. Again, leave the IC socket pin hole open for later installation of the IC socket.

Inspect adjacent wiring and circuit pads for accidental solder bridges. Remove excess solder.

Find on the foil pattern the location for C104 (near U102 pin 6 and ground). The solder pads for C104 are not on the circuit board. Place C104 flat on the circuit board. Connect C104 between U102 pin 6 (at R103 connection) and the adjacent ground foil.

Finally, refer to the foil layout (upper left) on Figure 10. Those who want to take advantage of the saturated collector of Q1 for relays, LEDs, etc. should connect a wire from that collector to the hole representing the fifth position from the lower left of the card edge (see dashed line).

In Closing

Hornblower is designed to be limited only by the imagination of the user. It's virtually impossible to detail all Hornblower applications. One word of caution: Do not put a high voltage across the Hornblower. Use low DC control voltage when using Hornblower for control of AC devices, or devices using DC voltages greater than Hornblower's source voltage. For example, do not use small circuit board mounted relays to switch 120 VAC circuits. Instead, mount a separate relay with suitable insulation specifications in a separate enclosure. See Figure 13A and 13B.

My prototype Hornblower has so far given me totally reliable service.

Hornblower's application development has been slow, but well worth it. Anyone fond of "warming up the iron" will find this a delightful project!

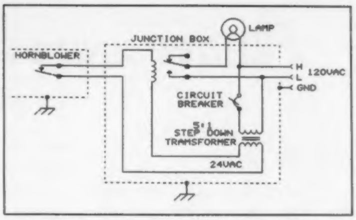


Figure 13A. 120 VAC wiring diagram.

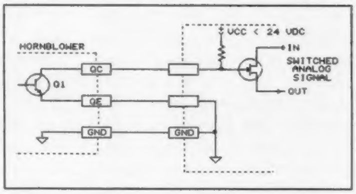
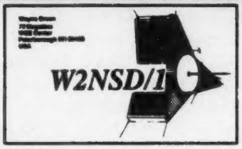


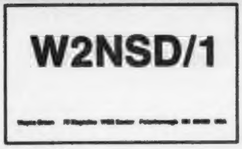
Figure 13B. Typical analog switch control circuit.

QSL Cards

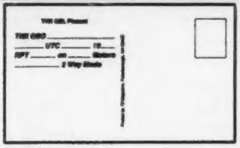
Style W



Style X



Style Y



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Please print!
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City ____________ **State** ____ **Zip** ____
☐ **AE** ☐ **MC** ☐ **VISA** ☐ **Check/MO**
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Number 25 on your Feedback card

ABOVE AND BEYOND

VHF and UHF Operation

ON THE ROAD

Is it July already? Time sure flies when getting ready for the summer contest season. As of this writing, three of the ARRL Spring Sprints are now history (144, 220 and 432 MHz), and activity levels have been high. I decided to have some fun during the 220 Sprint by going portable with the IC-375A and one of the new Tonna 11-element yagis. Everything was stuffed into my Honda, along with a Mirage C1012 amplifier, keyer, portable masting, compass, clock and logbook.

The "scheme" (as they say in England) was to drive up to an area just northwest of Hazleton, Pennsylvania, find an appropriate high spot and operate from grid square FN 11. Activity from this grid has been sparse, with only one regular operator aside from the major VHF contests. I obtained topographic maps of the area and found several potential sites–all easily accessible from major roads.

The first mistake I made was leaving too late. Since the sprints run from 7-11 PM local time, it would have been very smart to arrive at the site by 6 PM or 6:30 PM. This in turn meant an easy set-up with lots of daylight left. A great plan–except I left my house at 6:20, over 90 minutes from my ultimate destination. Well, no problem there. I'd just make some contacts from the car.

Unauspicious Beginning

Twenty minutes into the trip, the IC-375A suddenly shut off completely–dead to the world. After pulling into a nearby truck stop, I removed the covers and did some poking around. No blown fuses to be seen anywhere! After some prodding, the rig did fire up, but with a severe RF feedback problem. Some more poking around somehow cured it and the IC-375A sprang back to life.

By this time, I'd gobbled up almost 20 minutes and almost scrubbed the mission (which, in retrospect, would have been smart) but set out on the Pennsylvania Turnpike for parts north. After driving the better part of an hour, I was but 15 miles from my destination when the bad news came via WA3AXV: Yes, FN 11 was on the air. Great. No point in continuing that way, and besides it was getting quite dark. A quick glance at the map and I detoured back towards the Pocono Mountains to try and find a site in FN 21. Not as rare a grid, but better than nothing!

After a lot more driving, I finally picked a roadside turnout atop a 2000+' plateau and set to work. It was now 8:45 PM, and I quickly erected 15 feet of masting, along with the Tonna yagi and a short 9913 pigtail. The Mirage C1012 was wired in the line and the IC-375A promptly went berserk due to some strange RF feedback loop. Extremely frustrating! The amplifier was shut down but the preamplifier proved useful as I proceeded to log 20 contacts in the next hour, with the spread over a half-dozen grid squares.

Mission Aborted

Around 10 PM, dark clouds rolled over and high winds kicked up, threatening to send the Tonna back to France via air mail! Discretion being the better part of valor, I lost no time in artfully kicking over the masting, completely tangling myself in the guy lines in the darkness. After wrestling with rope, coax and the stiff breeze, everything was stuffed into the Honda and the tailgate slammed shut. (I still haven't found my logbook!) The outside temperature had dropped to about 35 degrees, so out came the extra jacket and a thermos of hot chocolate.

Home never looked so good as I rolled in just after midnight, swearing up and down I'd "never do this again" as I always do after a grid trip. Want to know a secret? It really was fun seeing some new countryside and surprising everyone who thought I was home in FN20. Besides, I stopped in at one of these vacation homesites and boy, what a great deal I got on 2 acres with a lakefront view...

Beacon Update

The ARRL VHF-UHF Advisory Committee (VUAC) has recommended by a 15-1 vote, that the Membership Services Committee study the possibility of new segments for automatic beacon operation. This information was mentioned in the May issue of *QST,* and I have obtained information from the League regarding the proposal in detail.

Basically, there is a movement to shift automatic beacons on 2 meters and above, away from their present allocations, to avoid interference to EME operations. According to the League, many seasoned VHF/UHF weak signal operators have filed comments stating that such beacons also interfere with the National Calling Frequencies from 144 through 1296 MHz. I have not seen any of these comments other than those filed by Chip Angle N6CA. He asserts that beacons do interfere with moonbounce activity and in many cases run more power than is required for the propagation path.

The FCC-defined beacon subbands are (Part 97.87 (e): 144.05-144.06 MHz, 220.05-220.06 MHz, 222.05-222.06 MHz, and 432.07-432.08 MHz. No FCC regulations exist at this time to govern beacons above 450 MHz. The ARRL VUAC proposal would shift beacons according to the following table:

144.275 to 144.300 MHz
220.275 to 220.300 MHz
432.300 to 432.400 MHz
902.300 to 902.400 MHz
1296.300 to 1296.400 MHz
2304.300 to 2304.400 MHz
3456.300 to 3456.400 MHz
5760.300 to 5760.400 MHz
10368.300 to 10368.400 MHz

The Membership Services Committee has been asked to present its findings to the ARRL Board or Executive Committee in July. MSC has also been asked to consider whether or not to petition the FCC to incorporate the changes above 450 MHz in Part 97. (At the moment, no such regulations govern beacons above 450 MHz.)

How do you, the reader, feel about this proposal? I sensed considerable objections at the April meeting of the Mt. Airy VHF Radio Club, many of whose members are active on microwave frequencies and have built and operate beacons. The consensus was that what might be a "West Coast" problem wouldn't necessarily be so in this part of the country. Indeed, I've yet to hear any complaints about beacon operation with regard to EME and calling frequencies (which, for the record, are in every case at least 20 kHz higher than the upper beacon subband limit).

Most operators felt that things were best left alone, especially on 902 MHz and above. In many cases, having the beacon close to the calling frequency allows a quick check of propagation without having to jump up the band 300 or so kHz. Also, operators use beacons on 902, 1296 and 2304 to resolve their actual operating frequency...I certainly do on 1296! Another point to consider: It makes sense to have the beacons situated as low as possible within each band as the MUF creeps higher during enhanced conditions.

Whatever your opinion, please convey them to John Lindholm W1XX who heads the Membership Services Committee! Or, contact the local ARRL official (preferably Division Director or Vice-Director) as soon as possible. While changes might be necessary to accomodate 2 meter EME users, I'm not totally convinced of any problem on 220 and 432, and see no good reason to make any changes at 902 and above. The activity levels don't support such a change–at least not in this geographic area.

Coming Attractions

Next month, I'll have a full report on grid expeditions for the 902, 1296 and 2304 MHz Sprints, and hopefully they'll be somewhat more successful than 220 was! Also, a sneak preview of the new Yaesu FT-790R 70cm portable (companion to the FT-690R and FT-290R 6 and 2 meter units), just released by Yaesu in time for Dayton. I still maintain these are the best VHF/UHF radio values around...a portable, mobile and base station all in one package at an excellent price.

Perhaps I'll be fortunate enough to work some readers as I go on a few DXpeditions this summer. The CQ WorldWide VHF WPX on July 16-17 will see me tripping through FN14 and FN24 in upstate New York, working 50 through 2304 MHz. The August UHF Contest will see a trip to either FN23 or FN34 for microwave operation, and it should be fun.

Whatever seems intriguing... now's the time to plan it, and get that new antenna up... install that new transverter... build that new preamplifier... or go grid-hopping. Remember, all of the summer contests offer seperate competition categories for QRP Portable stations, and at least two offer trophies for the effort (June VHF QSO Party and July CQ VHF WPX). Why not give it try? See you in August...Above and Beyond.

Number 26 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Baltimore MD 21208

Eleven Years of RTTY Loop!

This column is now entering its *twelfth year* of publication. I thank each loyal reader for allowing me to present the news of radio teletype and digital communications in what has hopefully been an informative and entertaining blend.

This coming year's Loop will see added topics covered, such as an increasing emphasis on the world of digital communications other than five-level Baudot. Many readers have expressed an interest in learning more about basic computing—this column will soon cover some of the *basics* of this.

PClone RTTY

A few months ago, I mentioned radioteletype for the IBM™ PC and PClone series, and hinted that an old friend had produced a new gem worthy of appreciation. This friend is Clay Abrams K6AEP, and the gem is a likely successor to the CoCo NRTTYCW program, a new work co-authored with Michael Meeks WA4VEF called "CPR." Running (C)W, (P)acket, and (R)TTY, this reasonably priced software may be just the ticket for the amateur wishing to get onto radioteletype with a PClone and a "smart" interface.

The choice for the amateur wishing to get onto RTTY with a computer is a simple one: software or hardware? Software may be inexpensive, but often lacks sophistication and flexibility.

Hardware solutions are more expensive—a good smart interface such as the one used here is about $300. That buys a box, however, that can bring signals out of the mud, and allows incredible flexibility and features, often with the assistance of a front-end program such as CPR. All serious RTTYers should try to set the money aside for a smart interface.

CPR

CPR is set up to use a variety of interfaces, with information provided for the AEA PK-232, Kantronics UTU, KAM and packet controller, and Tono Theta 777. Data is given for how these interfaces are configured.

Documentation is a 23-page manual on the disk, printed out with the "PRINT CPR.PRT" command. The file is full of little formatting codes that, on an Epson compatible printer, produce indents, bold face, underlining and the like. Hopefully, future editions of this manual will appear in straight ASCII without these codes. This way, they may be printed by other printers without problems, as well as viewed on the screen with TYPE or LIST commands. Formatting aside, the manual is thorough and covers the program fully, as well as instructions on customizing the files used to interface with the RTTY modem.

Clay even supplies a public domain editor, FRED, on disk, which is less clunky than EDLIN. This is useful for those who don't have a word processor they feel comfortable running in ASCII (non-document) mode.

CPR can operate in a variety of modes to best suit particular operating habits. A dumb terminal mode is provided for the classic "glass Teletype" look, as well as a more useful split screen. Since the program operates through a multi-mode interface, all digital modes are normally supported, including RTTY, packet, and AMTOR, along with CW.

Transmit or receive buffers are supported, which may be up to 640K long! Not only may data be stored, but one can look at what's in the buffer while it's still receiving data. Single function keys can enable the sending of ten station buffers, each of which can hold twenty characters. This is useful for calls, IDs, and the like. If that's not enough, there are ten variable length (up to 64K) buffers that may be loaded off disk and transmitted directly.

The user has nineteen definable function keys at his disposal. He may also specify the colors used in parts of the program, to help him identify various data fields. There's even a series of help windows that can "pop up" during split screen operation to describe all functions of the program.

Clay took a drubbing with the CoCo program as copies were circulated around to friends and neighbors. This friendly sharing was one of the reasons he was reluctant to re-enter the amateur software market. With CPR, he has put at least one fly—a very large fly—in the ointment. The registered user's name is hard coded into the program and appears on the screen when the program is booted. My name on my registered copy is well hidden—I was unable to find where he had stashed it. Who wants to advertise they're illegally sharing their ware?

> ***"All serious RTTYers should try to set the money aside for a smart interface."***

The program is available from Clay for $30 (US or CDN), with $3 for shipping and handling for foreign orders. Drop him a note at 1758 Comstock Lane, San Jose, CA 95124. Be sure to mention RTTY Loop.

Looking Ahead...

Now, it's the readers' turn—what do you want to see? There's a plethora of topics. I could start at the bit/byte level, including such wonderful things as hexadecimal arithmetic and what's a 150 ns chip, anyway? There's also plenty to say about interfacing and RS-232. How about a discussion on why TV pictures don't look as good as computer monitor images? The range is indeed broad, so here's the proposal: I will set aside an area—called "Byte Bin," or "Computer Corner"—to address these topics. Drop a card or E-mail to the addresses listed below with questions pertaining to this. A reader should do this also if he feels he can clarify a complex and oft-touched upon topic, so that all the readers—me included—can benefit from it.

Looking Back...

Many readers continue to ask about previous columns. An updated index of RTTY Loop covering the first eleven years is available. Simply send a self-addressed, stamped envelope with postage for two ounces and specify the RTTY Loop Index. Also still available is the CoCo RTTY program from the January 1988 column. I'll send that along for a disk, $2, and a self-addressed, stamped mailer.

PClone owners should also keep in touch. I have a line on some of the PD RTTY programs from bulletin boards. For the same arrangement as above, I'll send along interesting PC files as they appear.

Electronic mail is always welcome, either via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). Please be patient for the reply. Send USPS mail at the above address, always enclosing a SASE.

Next month, a fancy commercial program to look at, and perhaps a peek at the National Bureau of Standards in your backyard. Interested? Don't miss the August RTTY Loop! ■

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ATV

Ham Television

Mike Stone WB0QCD
P.O. Box H
Lowden, Iowa 52255

Can ATV be digitized? Of course it can. Video digitizers are available in the marketplace for just about any home personal computer at a reasonable price. Some computers like the IBM PC (and Clones) have several to choose from at different resolution values. Bill Brown WB8ELK of Findlay, Ohio, and his brother Jeff have been enjoying videotaping Fast Scan TV pictures and then running the taped image through a video digitizer for the Radio Shack TRS80 Color Computer to produce excellent hard copy printouts! It is fun to do this and capture that memorable long distance Ham-TV QSO for your paper scrapbook.

The television signal itself can be digitized to some 56K with a good displayed image. Unfortunately, this type of gear is too costly for the common ATV shack. Bruce Brown WA9GVK of the Metrovision ATV Club in the Washington, DC, area can give details on what tests the Navy has conducted on Digital TV. In Japan, there are now TV sets available that digitize the TV signal itself. This enables a viewer to watch one program while keeping track of one or two other channels at the same time.

Slow Scan TV of course has been digitized for many years. The days of burning images on P-7 tubes are long gone, and quality images sent on SSTV in color now rival real time TV. Clay Abrams K6AEP in San Jose, CA is already experimenting with a high-resolution digitized system using something much different than CGA or EGA monitor display standards. While the ROBOT 1200C continues to reign the SSTV world with the best pictures for the money, computers and their software are quickly catching up.

ATV in Space

Interest in narrowband TV techniques has renewed here in the USA again, and a few brave Ham-TV souls are playing with reduced bandwidth methods that might end up even on a future Space Shuttle. The present NASA ATV proposal, written by N9AB, under the auspices of the Motorola ARC, does not allow the majority of Ham-TV Amateurs here in the USA, let alone the world, to work any future Shuttle Flight on the TV mode. Henry B. Ruh KB9FO of the Chicago PATC Group now has an alternative NASA ATV proposal before NASA and League Officials, which describes a narrower bandwidth TV mode that looks more promising than the Motorola proposal. Henry's entire proposal was printed in the March/April 1988 issue of *The SPEC-COM Journal*. See sidebar for a summary of the proposal. Comments have looked encouraging from NASA officials and even NBC Science Reporter Roy Neal K6DUE commented in a return acknowledgement letter to KB9FO on March 24th . . . "I think you have a major plus in your thinking. It is something many hams can handle. You might keep in mind that the great majority of hams are not interested in ATV . . . But NASA is, and the future of ATV in manned space may be very dramatic. Keep me posted."

Skeleton-Slot Antenna

Included in this month's ATV column is a drawing of a Skeleton Slot dual-beam antenna cut for ATV by W4LUB. It can be mounted vertically or horizontally. Note the 7-inch dimension setting in Fig. 1 between elements and construction all out of PVC pipe for the support mast. Hooking into the beam couldn't be any simpler as shown in Fig. 4. Element lengths for the 10 elements are also depicted. The reflector is made from ½" hard drawn copper tubing with sweated elbows. This design was published several years ago in "A5" or SPEC-COM and has been built by many FSTV UHF enthusiasts around the country. The system has good proven gain and sufficient band width to handle the wideband ATV signals. The simple design should not be substituted however, for the better, longer, higher gain DX arrays. Thanks W4LUB and WB4AOH for the submitted information.

Those of you who have the popular Radio Shack TRS80 Color Computer should send us an SASE for our latest Amateur Radio Software catalog. The new revised May catalog has a lot of changes. The biggest change has come in the popular COCORADIO "interfaceless" disk package. Version 8.0 is out and everything–I mean *everything* (SSTV, FAX and all)—is now on just one single disk! ($49.95). Free updates to those who are registered users ($3.00 asked for return mailing). Return only your main operating disk, not the SSTV and FAX picture disks.

ATV Special Events

As I typed this column on Easter Sunday April 3rd, our local ATV gang had a ball this evening. We had our regular FSTV NET in conjunction with a bigger FM NET on 146.28/88 MHz. At about 9 PM, Matt N0GIK who works at KWQC-TV Channel 6 (NBC) in Davenport, broke in on one of our 10 computer screen 910 MHz link channels and said, "Hey fellas watch my special show from the Newscenter. The show begins at 10 PM!"

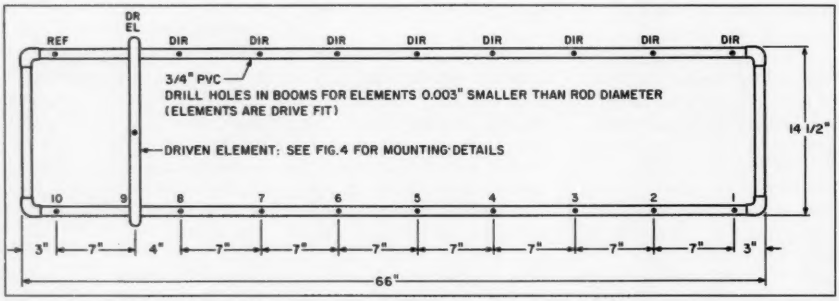
DR
EL
REF
DIR
DIR
DIR
DIR
DIR
DIR
DIR
DIR
3/4" PVC
DRILL HOLES IN BOOMS FOR ELEMENTS 0.003" SMALLER THAN ROD DIAMETER
(ELEMENTS ARE DRIVE FIT)
DRIVEN ELEMENT: SEE FIG.4 FOR MOUNTING DETAILS
14 1/2"
10
9
8
7
6
5
4
3
2
1
3"
7"
4"
7"
7"
7"
7"
7"
7"
7"
3"
66"

Figure 1. Boom dimensions for the Skeleton-Slot Dual Beam antenna.

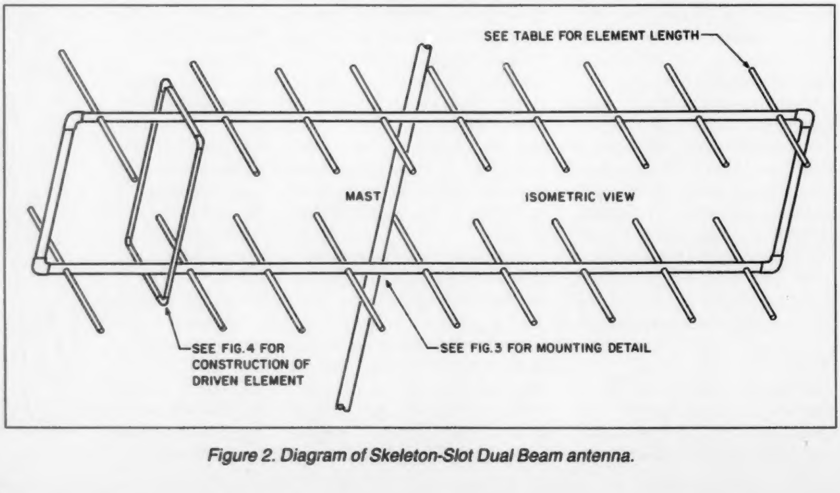
SEE TABLE FOR ELEMENT LENGTH
MAST
ISOMETRIC VIEW
SEE FIG.4 FOR CONSTRUCTION OF DRIVEN ELEMENT
SEE FIG.3 FOR MOUNTING DETAIL

Figure 2. Diagram of Skeleton-Slot Dual Beam antenna.

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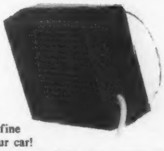

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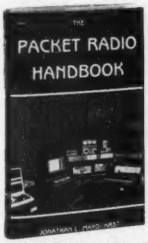

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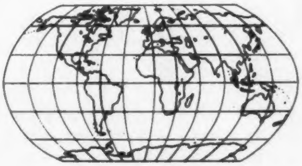

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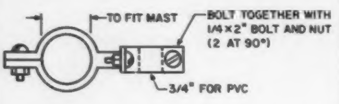

ELEMENT LENGTH	
EL #	LENGTH (INCHES)
1	10 1/4
2	10 1/2
3	10 5/8
4	10 3/4
5	10 7/8
6	11
7	11 1/8
8	11 1/4
9	SEE FIG.4
10	13 1/2

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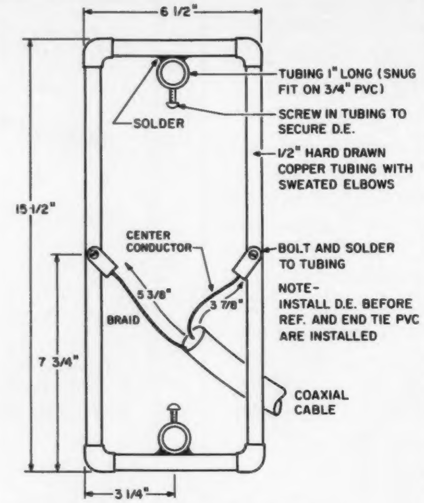
Figure 3. This figure shows the mast/beam connector. Table gives element lengths.


6 1/2"
TUBING 1" LONG (SNUG FIT ON 3/4" PVC)
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NOTE-
INSTALL D.E. BEFORE REF. AND END TIE PVC ARE INSTALLED
5 3/8"
3 7/8"
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7 3/4"
COAXIAL CABLE
3 1/4"

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Figure 4. Driven element for the Skeleton-Slot Dual Beam antenna.

He hooked up to the control room and camera feed, and we got to see all the activity behind the scenes (anchors off camera, weatherman standing in front of chromakeyed background, etc.). All commercials and other station facility IDs were edited out, so we only saw legal material just like anyone would see from a remote camera. It was really neat, and some of us taped the event.

It is important that all ATV Groups or Clubs plan some sort of special event a couple times per year just to keep interest up. April 16th we had our 3rd annual ATV T-HUNT. Our contest is a video TV image signal hunt only, with no RF sniffers allowed, and the winner in each year's contest automatically becomes the hidden rabbit in the next year's event. Those who live in "dead" or inactive ATV areas with amateurs who have gear sitting around have only yourselves to blame for snowy pictures on your screens night after night. With Field Day approaching, what better way to promote the ATV to other hams than to include FSTV and SSTV in the club station?

In addition, building an ATV remote transmitter system (not necessarily a repeater) is a great way to boost activity! We have written dozens of articles about the benefits and pitfalls of these systems in the past. If you or a group of Amateurs is seriously interested in building up such a system or wants to find out how to build an ATV Repeater, I would suggest that spending $10 and obtain Ralph Wilson's newest reprint booklet #101, *ATV Repeaters*. He also has another new booklet out entitled *Microwave Guide* by Mike Veldman WD0CTA #112 (same price). Ralph's address is ESF Copy Services, 4011 Clearview Drive in Cedar Falls, Iowa 50613.

Finally, USATVS Member Ray Stevens W2BYO writes that he is willing to buy one of the neat little Mitsubishi Visitel Phoneline SSTV Converters if others will and get on 20 meters to exchange the quick 5.5 second B/W pictures. The converters were mentioned in the February and March/April issues of *SPEC-COM* and the January 1988 New Product listing in *73 Magazine*. Contact Ray at P.O. Box 235 in Wellsville, NY 14895.

Well that is about it this month Ham-TV fans! I hear that there has been a drop recently in the number of votes for the ATV column in *73* on the Reader Service cards. Please, let's keep this unique and important momentum going for a National ATV column each month in *73*! . . . WB0QCD 73

ATV in Space

[*The following is a summary of* Proposal and Issues for Amateur Television on Future Space Missions to Allow Worldwide Participation *by Henry Ruh KB9FO. Forward comments to him at 540 Oakton Street, Des Plaines, IL 60018.*]

Objectives

Amateur television on future space missions should foster international interest and participation well beyond the six thousand hams who now enjoy this mode. Reducing the technical requirements and equipment costs for ATV participation would significantly increase the pool of ATV users. Increased international participation would promote technical advancement as well as international goodwill on a greater scale than possible now.

Current Proposals

Several groups, including a Motorola-sponsored ATV club, have proposed methods for operating ATV from the Space Shuttle and the Space Station. These proposals have various advantages, but their shortcomings should be addressed, as well.

In particular, the Motorola proposal concludes that 439.25 MHz would serve as the best frequency of operation. A full bandwidth ATV system for space operation would require 1500 watts PEP output into a 17 dBi gain antenna. This power requirement would immediately limit the number of participants largely due to amplifier cost. Further, assuming 30% transmitter efficiency, 1500W PEP output would require 4500W input, a power level not allowed by current FCC regulations. The proposed 439.25 MHz frequency would also be subject to interference from FM repeaters, and many countries with only 10 MHz allocation on 70cm (430-440 MHz) would not be able to participate, because the signals would be partially out of band. The only choice for international space ATV communications that is subject to the least interference is 434 MHz. The Motorola proposal does not address ATV transmissions on higher frequency bands such as 902 or 1280 MHz.

By specifying only fully bandwidth NTSC-format video transmissions, the Motorola proposal excludes two thirds of the potential participants, since most other countries use PAL and SECAM video signals. These systems are not compatible due to different scan rates and color subcarrier frequencies. Monochrome transmissions would allow all systems to receive images with unmodified or slightly modified monitors.

Narrowband Techniques

Considering the bandwidth limitations imposed by many countries on 70cm, narrowband TV (NBTV) techniques should be considered. NBTV would require only 2 to 2.5 MHz bandwidth, which is suitable for full motion black and white pictures. Further, NBTV provides an improved noise level, diminishing effective radiated power requirements by 3 to 6 dB.

FM modulation of the video carrier would permit use of readily available FM transceivers to recover the audio information. Users can also generate their own audio subcarrier locally with a low power oscillator for whatever frequency is required for proper reception. This system is fully compatible between NBTV and full bandwidth systems used internationally, whereas the Motorola proposal falls considerably short of the stated objectives.

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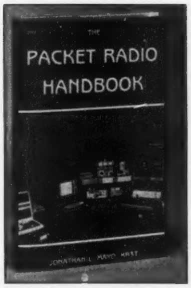
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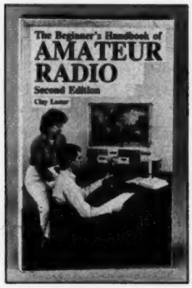
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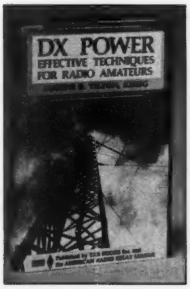
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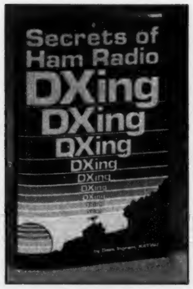
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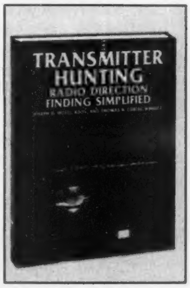
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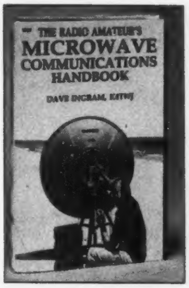
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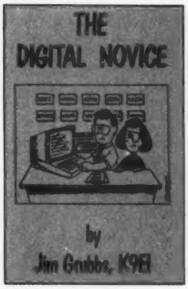
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AERIAL VIEW

Antenna News

Arliss Thompson W7XU
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INSTALLING BEAM ANTENNAS

Fall is on the way, and the antenna raising season is here. Even now new towers are poking their heads above the skyline, waiting for their owners to adorn them with arrays of aluminum. Unfortunately, more than a few hams don't know how to move their new beam (which currently occupies most of the back yard) from ground level to the top of the tower. This month's column offers some ideas on how to safely install even large HF beams atop towers.

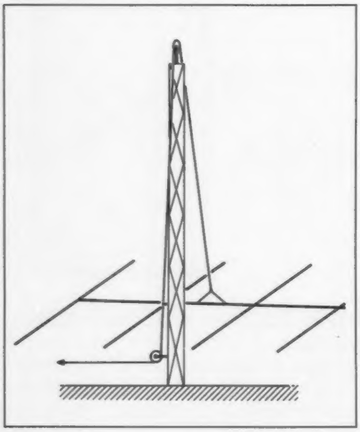

Figure 1. Raising assembled antenna on free-standing tower.

Safety and Planning

Since some readers already have a tower in place, I assume they have a quality safety belt and are aware of basic safety procedures related to climbing towers. I feel compelled to remind them, however, of the need to be alert for power lines and other hazards that are a potential threat to not only antenna and tower, but also to life. In fact, it's a good idea to have one person whose only job is to stand at the side of the operation and be alert for accidents that are about to happen. Also, before ever leaving the ground, the climber and ground crew should have a firm plan in mind. In order to minimize confusion, only the ground crew leader should be conversing with the climber(s) on the tower. Whoever is on the tower should have the ultimate say in what is to be done, since they are in the position of greatest risk.

If the reader has never erected a tower nor mounted a beam atop one, I suggest participating in an antenna raising parties for other hams. Besides providing what will probably be some needed muscle, it's good training.

With those thoughts in mind, it's time for the antenna raising.

Going Up

Of course, using a "cherry picker" is the way to fly, but few hams have such resources. What are the realistic alternatives?

Hams who own a free-standing or crank-up tower definitely have it over those with a guyed tower. Those with the former arrangement can assemble their antenna on the ground, and pull it into position with the aid of a gin pole or pulley temporarily mounted at the top of the tower (Figure 1). Attach the rope to the antenna's center of gravity, which should also be the point where the boom attaches to the mast. Doing so will minimize the tendency of the antenna to tip to one end or the other, although it may still tend to rotate vertically about the axis of the boom. If additional control of the antenna proves necessary (due to wind, perhaps), lightweight lines can be secured to the boom as shown in Figure 2. Be sure that those ropes can be removed once the beam is in place. Also, make sure that the rope harness for raising the antenna doesn't interfere with the mounting of the boom to the mast once the antenna is in place.

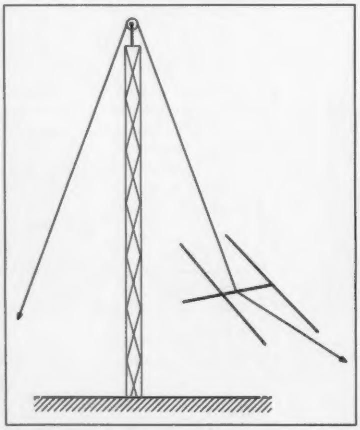

Figure 2. Raising antenna sections to be assembled on tower.

"Before ever leaving the ground, the climber and ground crew should have a firm plan in mind."

Antenna assemblers with small backyards may not be able to lay out the fully assembled antenna on the ground prior to erection. In that event, raise the antenna in sections and complete assembly at the top of the tower. This process is shown in Figures 2 and 3. Figure 2 is similar to Figure 1, except that in Figure 2, only half of the antenna is being hoisted at any given time.

If lack of space prevents ground-level assembly of even half of the antenna, I suggest using the method shown in Figure 3. This uses the Potomac Valley Radio Club (PVRC) mount, described in *QST* (March 1982, pp. 28–29) and in recent editions of the *ARRL Handbook*. Basically, the mount permits the boom to rotate 360 degrees in two planes, thereby allowing the boom to be brought alongside the tower for mounting the elements. Using the PVRC mount, it's possible to assemble large antennas on the tower even if obstacles on the ground preclude assembly of more than one element at a time there.

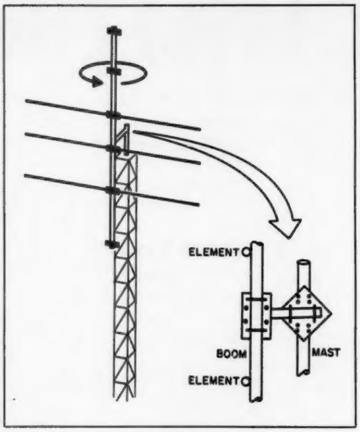

Figure 3. Assembling antenna with PVRC mount.

Trouble with Guys

Free-standing towers certainly are convenient. Unfortunately, they are also considerably more expensive than their guyed equivalents, so it's not surprising that many hams find themselves with guyed towers. Depending on the circumstances, positioning any sort of beam atop a guyed tower is often difficult, particularly when attempting to use the methods shown in Figures 1 and 2. I have used the latter method to successfully maneuver a large tribander past several sets of guys and into position at the top of a 70-foot tower. If there isn't good coordination among the workers involved, however, it's all too easy to bend elements or otherwise damage the antenna.

Temporary repositioning of the obstructing guy wires is one solution to this problem, although finding a suitable anchor point may be difficult, or at least inconvenient. Offsetting the uppermost guy wire while installing the antenna, or allowing it to go slack after temporarily attaching an additional guy at a somewhat lower position on the tower will, however, allow the use of the PVRC mount on guyed towers. Following that route permits the installation even on large beams on guyed towers when ground space is at a premium.

Another method suitable for use on guyed towers is the so-

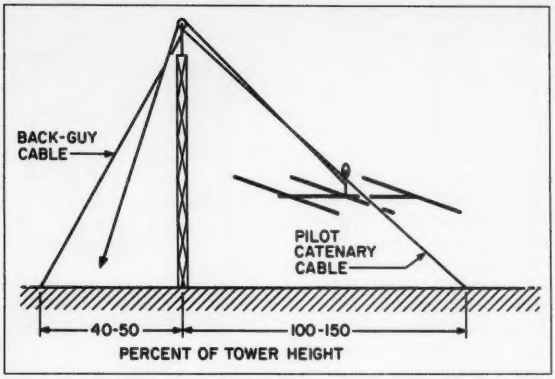

Figure 4. Pilot-catenary back-guy method of erecting antennas.

called pilot-catenary back-guy (PCBG) system, shown in Figure 4. With this method, the antenna rides into position while being suspended from a pulley that rides on the pilot catenary cable. A back guy cable, 180 degrees opposite the pilot catenary, eases stress on the tower and mast. This method requires the top set of guys to be temporarily dropped to avoid entanglement with the beam as it is being raised into position. The back guy and catenary, however, hold the tower very steady during the short time that it takes to raise the beam. When using this method it will be necessary to have a clear space on the ground large enough for the fully assembled antenna. The erector will also need sufficient room to anchor the back guy and pilot catenary cables. Typically, a horizontal distance equal to 150 to 200 percent of the tower height is required. Additional details on this method of installing antennas are available in Young's article on the subject in *The ARRL Antenna Compendium*, Vol. 1, pp. 144–145.

The tram system, and variations thereof, allows a beam antenna to be raised on a guyed tower without requiring even temporary changes in the guy wires. The basic arrangement is shown in Figure 5. A pipe approximately ten feet long is secured in a horizontal position at the apex of the tower. (One can use two by fours or other lumber, if sufficiently stout, in place of the pipe). Parallel ropes run from either end of the pipe (or 2 x 4) to temporary anchors at ground level. The ropes are situated so that they lie above the highest set of guys. The antenna is then placed on the ropes and pulled into position by sliding it along the ropes to the top of the tower.

The ropes upon which the antenna rides should be free of knots to avoid having the beam snagging during its ride upward. Attach a light line to the boom for better ground crew control of the antenna as it is being pulled up the rope track. Be sure this line is removable once the antenna is in the air. Alternatively, erectors can add a third rope or cable to serve as a guide line, with some temporary connections between the boom and guide line to keep the beam aligned with the track.

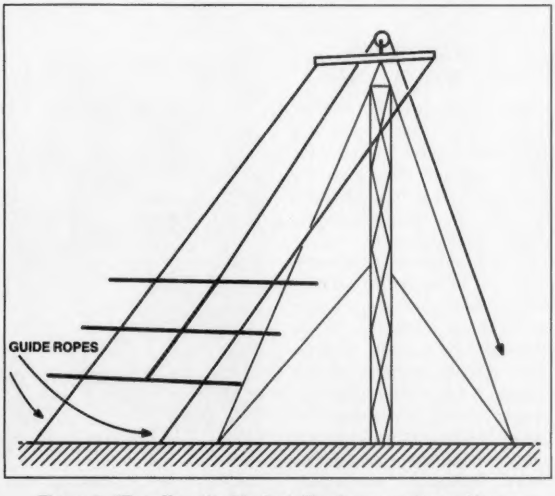

Figure 5. "Tram" method for installing beam on a guyed tower.

Walking up Masts

Attempting to "walk up" masts and hinged towers is a situation that can arise at any time of the year but is especially likely to occur during outings such as Field Day when there's a big need for temporary antenna supports. It often happens that one member of the Field Day expedition volunteers a small tribander that has been sitting in his garage, and two other participants bring a mast and rotor. Since it's not possible to climb the mast, even if it is well-guyed, the obvious way to raise the antenna is to attach it and the rotor to the top of the mast and then walk the assembly into position.

If the group is lucky, or better yet, has given the process some thought, this may work well. Unfortunately, what sometimes happens is that the realities of physics overwhelm the capabilities of the Field Day party, and the entire works come crashing to the ground.

A Brief Example

Figure 6 shows the forces related to walking up a mast or hinged tower. (F) is the force exerted at right angles to the tower in an effort to raise it to a vertical position. (H) is the height above ground at which that force is applied. The mast weighs (M) lbs and is (L) feet long. The rotor and antenna together weigh (W) lbs. It's assumed that the mast is of constant diameter and that the antenna is located immediately above the rotor. The maximum amount of force that must be applied to raise this combination to a vertical position occurs when the mast is at a 45 degree angle from the ground. At that point the force will be approximately:

$$F = L(M + 2W) \div 4H$$

Let's work through an example. Assume the mast is 40 feet long and weighs 60 pounds. The antenna and rotor together weigh 40 pounds. In other words, $L=40$, $M=60$ and $W=40$. Let's also assume that due to the heights and the lengths of human arms, the builder will apply a force centered at 6 feet above ground; i.e., $H = 6$.

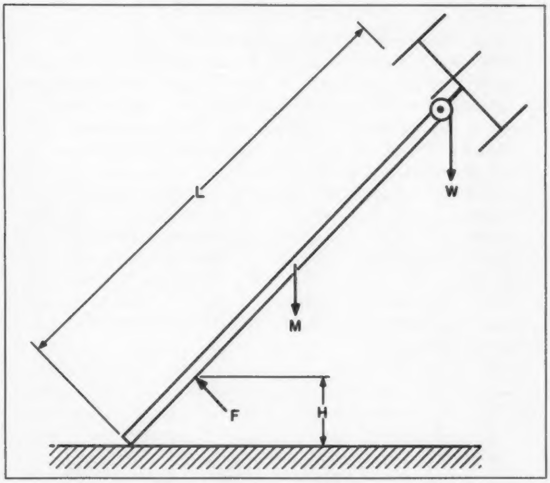

Figure 6. Forces associated with "walking up" a mast or tower.

As the mast is raised from the ground, the force required to keep the antenna from falling continues to increase until a 45 degree angle is reached, at which point it will equal $(40)(60 + 80)/4(6) = 233$ lbs. As mentioned above, that will be the force required if the erector is able to push at right angles to the mast. If he can't push at exactly a 90 degree angle, the required force will be even greater. Thus it becomes apparent why one or two persons trying to walk up even a relatively lightweight mast-antenna combination like this might find themselves in trouble. Why not try a little number crunching before risking crunching the yagi by trying to walk up a mast or hinged tower before knowing the forces involved?

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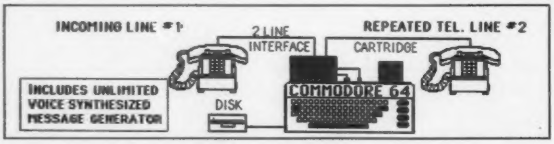
Compiled by Linda Reneau

ON
CAMERA
VIDEO GAIN
MIC PTT
MIC GAIN
POWER ON
P.C. ELECTRONICS

PRODUCT OF THE MONTH

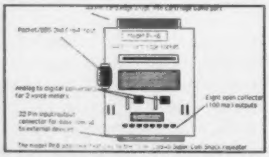
P.C. ELECTRONICS

P.C. Electronics introduces the new TX23 1 watt, 23cm (1240–1300 MHz) ATV transmitter, which enables the Novice class or higher amateurs, to transmit live action color or black and white composite video and audio from cameras, VCRs, or computers. It comes with one crystal on simplex 1289.25 MHz or specified ATV channels in the ARRL bandplan. The TX23-1 is small enough to carry in a knapsack for portable use. A switch is provided to select video and audio input. Two independent volume controls are also included. Power requirement is 12 to 14 volt DC at 600 mA, plus whatever the 12 volt camera draws. The antenna connector is a type N, and a BNC outputs to the receiving downconverter from the built-in RF T/R relay. The TX23-1 transmitter is $299 delivered UPS surface in the contiguous USA. *P.C. Electronics, 2522 Paxson Lane, Arcadia CA 91006; 818-447-4565.* Or circle Reader Service number 201.



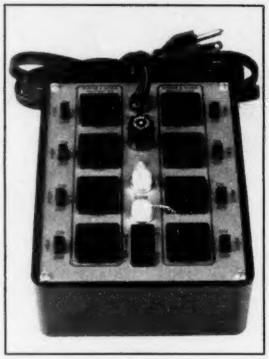
ENGINEERING CONSULTING

New from Engineering Consulting is their telephone repeater called Connect-A-Call. It includes voice synthesizer and three modes. Mode 1 is cellular (or any telephone) to WATS line, Mode 2 is cellular to remote call forward, and Mode 3 is auto-dial message call director. The Commodore 64, 64C, or 128 supplies the power. The Connect-A-Call has dual amplification and line ring detection, and remote hang up detection, safety timers, and programmable ring counter. Model CTW sells for $99.95. Model CS64W includes 2-line telephone interface, disk, telephone cables, and optional autoboot cartridge for $399.95. Or circle Reader Service number 219 for more information.



Engineering Consulting also has a Model PK-8, a 44-pin cartridge socket, including eight relay controls, two analog and alarm inputs, an expansion I/O, and cartridge slot to the CS64S for $149.95 *Engineering Consulting, 583 Candlewood St., Brea CA 92621; 714-671-2009.* Or circle Reader Service number 220.

KALGLO ELECTRONICS CO., INC

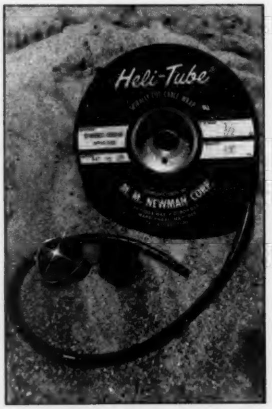


Kalglo Electronics has a new version of their 8- outlet console surge suppressor/noise filter. The Deluxe Power Console-Plus (DPC+) combines a quick response time (1 pico-second), 131 volt clamping, outlet wiring integrity checker, dual filtered and isolated banks, massive energy handling capacity, and a fail-safe system cutout. Separate status lights provide at-a-glance monitoring of both the protection circuits on all modes. The fail-safe feature will remove the system and connected equipment, from the AC circuit in event of damage to the internal protection components, to avoid possible damage from a second surge. A step up in Kalgo's SPIKE-SPIKER™ technology provides additional convenience and protection. Price is $125.95. *KALGLO ELECTRONICS CO., INC., Dept. DPC-PLUS, 6584 Ruch Road, East Allen Township, Bethlehem PA 18017-9359; 215-837-0700.* Or circle Reader Service number 202.

ACE COMMUNICATIONS

AOR, Ltd. of Tokyo, of which Ace Communications is a subsidiary, has a new AR800 handheld receiver with 800 MHz and channel scanning capabilities. It's small enough for your pocket, with the latest in Japanese circuitry. Its frequency coverage is 30–50 MHz, 118–136 MHz, 140–174 MHz, 436–512 MHz, and 830–950 MHz, with access to all police and emergency bands. The AR800 comes equipped with LCD, a rechargeable battery, and charger, for the price of $299. Circle Reader Service number 203.

M.M. NEWMAN CORPORATION



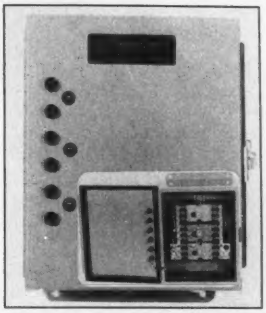
Heli-Tube® available from M.M. Newman Corporation, is a UV-resistant black polyethylene cable wrap and chafe guard for bundling and protecting wires or hoses. This expandable wrap applies like tape and resists abrasion, acids, alkalies, and solvents. Comes in six sizes from ⅛" thick to 1" thick for handling bundles up to 7". It has a 2000 psi tensile strength and maintains its qualities in extreme temperatures. Heli-Tube is priced from $.03 per foot, depending on quantity. *M.M. Newman Corporation, Charles F. Loutrel, Sales Manager, 24 Tioga Way, PO Box 615, Marblehead MA 01945; 617-631-7100.* Or circle Reader Service number 217.

COMMODORE BUSINESS MACHINES, INC.

For the work-at-home market, Commodore introduces its Commodore Colt PC-compatible computer. The Commodore Colt features WordStar/Colt word processing software, 8088 microprocessor and offers 4.77 MHz and 7.16 MHz clock speeds, 640K, built-in graphic adapters (CGA, MDA, Hercules, Plantronics Color Plus), video and mouse interfaces and parallel and serial ports. These features eliminate the need to add costly expansion cards and avoid loss of valuable internal space. With its many expandable features and IBM-PC/XT compatability, the Commodore Colt is designed for ease of use. Suggested retail price is $899.95. *COMMODORE BUSINESS MACHINES, INC., 1200 Wilson Dr., West Chester PA 19380. Call Lori Cross, at Fleishman-Hillard, Inc. 213-629-4974 or Keith Lindenburg at 212-265-9150.* Or circle Reader Service number 205.

VERITE

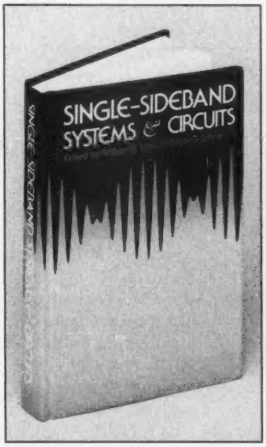
Verite's Veri/Protektor™ is a high current power protector for multiple equipment. It withstands 150,000 amps of spikes, surges, and transient line noise. The company says it will custom-design units for special voltages and applications, including devices with EMI, RFI and noise filtering, and isolation transformers with electrostatic shielding. It is available in single-phase or three-phase configuration. The Veri/Protektor HC carries a 10 year repair-or-replace limited warranty. Prices range from $795 for single phase to $1,299 for three phase. *VERITE, PO Box 697, Harbor City CA 90710-0697. Bill Ormsby, 213-832-1100.* Or circle Reader Service number 208.



SIQ
Repeater Controller

A-TECH ELECTRONICS

A-Tech announces the SIQ Repeater Controller. It provides basic repeater functions, Voice ID, programmable Morse code ID, Autopatch, Reverse Autopatch, audio mixing, 16 I/O lines which control link radio, PL tones, relays, and a complete manual. An optional phone patch board is also available. Touch tone commands are used to control the features such as the courtesy tones, tail squelch length, CW ID, and alarms. The SIQ repeater controller is available for $349.95. With phone patch, $449.95. *A-TECH ELECTRONICS, 1033 Hollywood Way, Burbank CA 91505; 818-845-9203.* Or circle Reader Service number 206.

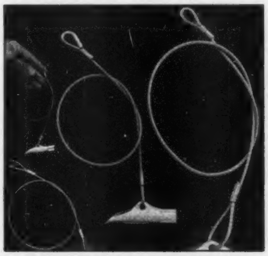


McGRAW-HILL BOOK CO.

Single-Sideband Systems & Circuits, edited by William E. Sabin & Edgar O. Schoenike, combines the expertise of 23 recognized authorities to bring the reader up to date on design, systems, circuitry, and equipment in radio and electronic communications technology. Mr. Sabin is a Design Engineer in the Advanced Technology Department, Collins Division, Rockwell International. Mr. Schoenike is Senior Technical Staff Member in the Advanced Technology Department. This 594-page, 6"x 9" reference book contains 378 illustrations and sells for $49.95. For more information write or call *McGraw-Hill Book Co., 11 West 19th Street, New York NY 10011; 212-337-5945/51.* Or circle Reader Service #215.

FORESIGHT PRODUCTS, INC.

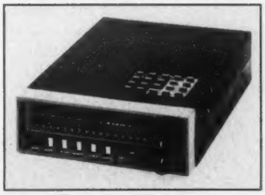
Duckbill Antenna Anchors are available from Foresight. The Anchors have a holding capacities of 300, 1100, 3000, and 5000 lbs. The Duckbill is driven into the ground until only the cable loop remains above ground. An upward pull on the cable rotates the anchor into a perpendicular load lock position and compacts the earth, rather than loosening it. For further information, circle the number on the reader service card or contact *FORESIGHT PRODUCTS, INC., 10780 Irma Drive, Unit 22, Northglenn CO 80233. Dick Allman; 303-761-3822.* Reader Service number 207.

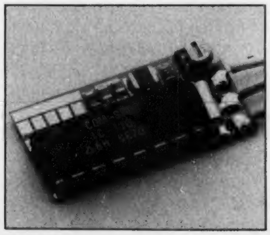


ACE COMMUNICATIONS

Also new from AOR is a 25-oz. mobile scanner, model AR160. The receiver covers 29–52 MHz, 136–174 MHz, and 436–512 MHz. It includes a fused DC power cable, telescopic whip antenna, mobile mounting bracket with hardware, and an AC to DC converter for indoor use. A battery retains the memory if power fails. Also included is LED display, 20-key access to the microcomupter, and high receptivity for only $189.

Ace Communications will handle product marketing and service through their Monitor Division located in Indianapolis, IN. For more information contact *ACE COMMUNICATIONS, Monitor Division, 10707 East 106th St., Indianapolis IN 46256; 317-842-7115.* Or circle Reader Service #204.



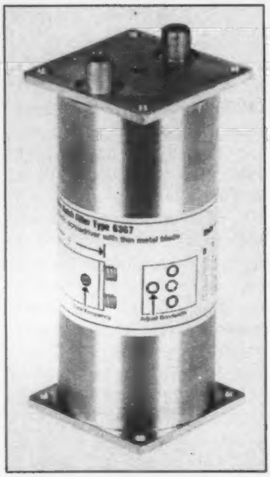


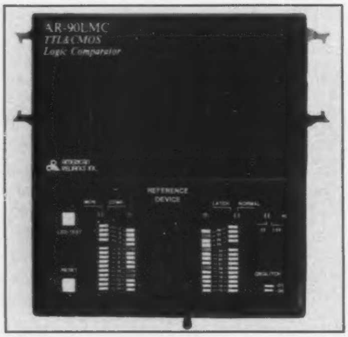
COMMUNICATIONS SPECIALISTS, INC.

Communications Specialists introduces the SS-32SMP, a programmable CTCSS encoder for hand-held radios and other applications with size restrictions. Any 32 tone frequencies between 0.01 Hz and 255 Hz may be selected for storage into a 32-bit EEPROM memory. The SS-32SMP may also be ordered to work as a six-tone encoder at no extra charge. Tone frequencies above 255 Hz may be ordered for a slight charge. The SS-32SMP features low impedance, low distortion, adjustable sinewave with adequate audio level to provide deviation for most hand-helds. It operates on 6–15 V DC so that voltage dropping resistors should never be required. The SS-32SMP is priced at $27.95. A Chip Component Kit for prototyping Surface Mount devices such as the SS-32SMP is also available. *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296. Michael Beveridge, Office Manager; 714-998-3021. FAX 714-974-3420.* Or circle Reader Service number 212.

MICROWAVE FILTER COMPANY, INC.

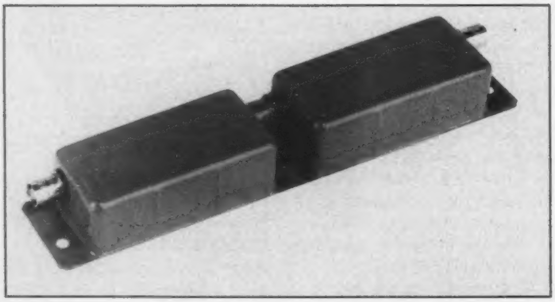
Microwave Filter Company introduces its 6367 series of tunable notch filters for 30–900 MHz. These filters cover an approximate 2:1 frequency range with an adjustable 3 dB bandwidth. Tuning range for model 6367-1 is 30–50 MHz, for model 6367-2 is 50–112 MHz, for model 6367-3 is 88–216 MHz, model 6367-4 is 216–450 MHz, and for model 6367-5 is 450–900 MHz. Minimum notch depth is 13 to 30 dB, depending on model. Price of models 1–3 is $139. Model 4 is $179 and model 5 is $169. Specify 50Ω BNC connectors or 75Ω F connectors. Or circle Reader Service number 209 for more information.





AMERICAN RELIANCE, INC.

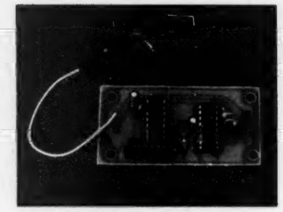
ARI announces their new Logic Comparator, the AR-90LMC. It features two modes of comparison, normal or latch, and allows direct viewing of logic states in the built-in monitor mode. A custom IC makes it possible to use both TTL and CMOS logic in a single model. The unit operates at 20 MHz and can detect a single timing error as short as 50 nanoseconds. The unit also tests ICs of up to 28 pins and includes both 16- and 28-pin test clips, an interconnect cable, carrying case, and operator's manual. Priced at $379. *American Reliance, 9241 E. Valley Blvd., Rosemead CA 91770; 818-287-8400. FAX 818-287-8855.* Or circle Reader Service number 218.



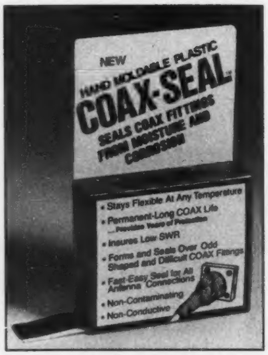
MICROWAVE FILTER COMPANY, INC.

Microwave also has a new bandpass filter, model 6209. This bandpass filter protects Ku-band digital information from interference by other satellite signals at the input to the receiver. Passband is 43–97 MHz and loss is 2 dB maximum. Return loss is 14 dB minimum. Lower stopband is 0–39 MHz and upper stopband is 105–450 MHz. Rejection for both upper and lower stopbands is 30 dB minimum. Impedance is 75Ω and connectors are BNC. The price is $225. For more information contact *MICROWAVE FILTER COMPANY, INC., 6743 Kinne St., East Syracuse NY 13057; 800-448-1666 or 315-437-3953, Ext. 52. For the Ku-band Receiver Bandpass Filter, ask for Jean Dickinson.* Or circle Reader Service number 210.

INTERNATIONAL RADIO, INC.



The IRI Bank Controller, a Kenwood accessory, is available exclusively through International Radio. It allows front panel memory bank control on the TS-940S, eliminating the need to open the hatch to change the memory bank. The IRI Bank Controller is a direct, plug-in substitute for the Voice Synthesizer. Through the "Voice" button, the user can step through all four memory banks. Fully assembled, CMOS circuitry, no power drain to memory backup cells. Price is $24.95 plus $5 for shipping and handling. *International Radio, Inc., 751 South Macedo Blvd., Port St., Lucie FL 34983; 407-879-6868.* Or circle Reader Service number 213.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HAND MOLDABLE PLASTIC
COAX-SEAL
SEALS COAX FITTINGS FROM MOISTURE AND CORROSION
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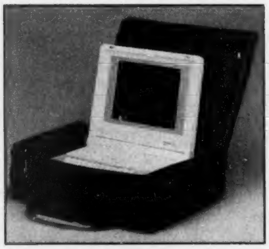
• Insures Low SWR
• Forms and Seals Over Odd Shaped and Difficult COAX Fittings
• Fast-Easy Seal for All Antenna Connections
• Non-Contaminating
• Non-Conductive

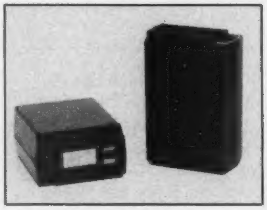
UNIVERSAL ELECTRONICS, INC.

Coax-Seal™ a rubber-based mastic sealant for coax fittings and connections, may be obtained from Universal Electronics. Coax-Seal stays flexible for eight years in extreme conditions and temperatures, which allows fittings to be disconnected and resealed. It is non-conductive, comes in a variety of shapes and sizes, and protects connector fittings from moisture, dust, and corrosion. A roll of Coax-Seal 60" long, ⅛" thick, and ½" wide on peel-away paper backing costs $2.49. Other sizes available. *Universal Electronics, Inc., 4555 Groves Rd., Suite 13, Columbus OH 43232; 614-866-4605.* Or circle Reader Service number 214.

JENSEN TOOLS, INC.



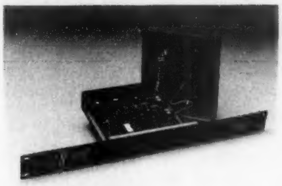
Jensen Tools offers Lap-Top Computer Cases in three models to accommodate NEC, Zenith, Toshiba, Tandy, and other popular lap-top computers. These soft-side cases are made of Propex. Model 363B001 is 18"x 13"x 4" and has an outside organizer pocket for the price of $109. Model 363B004 is the same size, but has a removable multi-pocketed portfolio that snaps inside the case cover for $129. Model 363B005 is 18"x 13"x 5" and includes an attached zipper close pocket for a computer printer as well as the removable portfolio for $149. For a free catalog of computer cases and accessories write or call *Jensen Tools, Inc., 7815 S. 46th St., Phoenix AZ 85044. Karen Richardson; 602-968-6241, Ext. 268, or 602-968-6231.* Or circle Reader Service number 211.



PERIPHEX, INC.

Periphex has Yaesu replacement battery packs for the FT-23R/33R/73R. The FNB-10, 7.2V 600 mA for 2.5W output, and the FNB-12, 12 volt 500 mA for 5 watt output, are both in stock. Charge with standard Yaesu wall or desk chargers. Both come complete with a 1-year guarantee. FNB-10 is $33, the FNB-12 is $49 plus $3 shipping. For further information on these or other battery packs, contact *Periphex, Inc., 149 Palmer Road, Southbury CT 06488; 800-634-8132 or 203-264-3985.* Or circle Reader Service number 216.

Factory-less, jumper-less, ROM-less programming.



With the new **S-COM 5K** Repeater Controller, you'll be able to configure your repeater remotely — using DTMF commands. Only the **5K** offers this capability for just $189, wired and tested.

- •Easy to interface
- •Polite ID'er
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- •Needs only 55 mA/12 V
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- •CMOS Microprocessor
- •DTMF Muting
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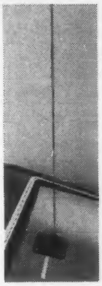
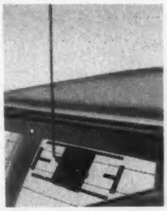
VHF
(140-175)
- No Hole
- Easy to Mount
- Rugged
- Superior Performance
- Radiator Snaps On and Off
- Competitively Priced



UHF
(420-520)
- 3 db gain
- No Hole
- Easy to Mount
- Rugged
- Superior Performance
- Radiator Snaps On and Off
- Competitively Priced

Cellular/Trunking
(800-895 MHz)
- 3db Gain
- No Hole
- Easy to Mount
- Rugged - Goes through Car Wash Without Removal
- Superior Performance
- Broad Bandwidth
- Small Size
- Competitively Priced



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	Amateur List	Intro (to 7/1)
PC*Packet	$139.95	$119.95
HF*Modem	$ 79.95	$ 59.95

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DRSI

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CIRCLE 239 ON READER SERVICE CARD

Number 30 on your Feedback card

QRP

Low Power Operation

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Massillon OH 44646

DIY CW KEYER

After two months of high-tech digital communications, it seems ironic that this month we're about to build a CW keyer. But what the hell, that's what we're going to do. This is such a simple construction project that it would be unfair to even consider it a "weekender." Perhaps a rainy Sunday afternoon would be more realistic.

The entire keyer is so simple that construction is limited to two integrated circuits. The timing and logic are supplied by integrated circuits 4027 and 4011 CMOS. A printed circuit board is also available, as is a complete kit of all parts, including the speed pot. All that is needed is a cabinet to install the circuit board. The small size of the PC board should make installation inside a small QRP transceiver painless. Take note, portable QRP ops: An extra box will no longer be needed when backpacking with HW-8 into the woods.

The printed circuit board is slightly larger than the 9 volt battery that operates the keyer. Don't worry about spending a lot of money on batteries either, the CMOS ICs consume such small amounts of current that there is no need for a power switch. A 9 volt battery should last about a year before it needs to be replaced. If installing the circuit board inside a radio, the host will supply the operating voltage. A battery will not be needed.

Basic Features

"How many bytes of memory does it have?" Whoa, looks like I forgot to mentions some small insignificant details. Hummm, in a word, none. In fact, it doesn't even have dot-dash memory.

"Well how about iambic keying?" Sorry. Not this time around. All this keyer does is make dots and dashes, except for the proper 3 to 1 timing for good-sounding CW. Remember, I said only two simple ICs, K-Mart specials, not large scale integrated circuits. Oh yes, I almost forgot, there is no on-board side-tone. A side-tone from the radio will have to be used to monitor the CW.

Figure one is the part placement for the keyer. This is from the component side of the printed circuit board. For those that want to "roll their own," figure two is the foil pattern for the keyer. Mike Michaels W3TS did the artwork from the original schematic. Speaking of original schematics, I did not design this keyer, but rather it comes from the German publications called *CQ-DL*. The keyer's schematic is shown in Figure 3.

EVEREADY
SUPER
HEAVY
DUTY

Photo A. Not much larger than the 9 volt battery that operates the circuit, the QRPer CMOS keyer.

Easy Assembly

Construction is simple and straightforward. For assembly, a PC board is available or perfboard may be used. Somehow, I can't imagine why anyone would choose to build the keyer without the PC board. If CMOS chips have never been used in a construction project before, some simple handling instructions are in order. Because of the high input impedance of the chips, they are easily damaged by static charges. Before handling the chips, touch a gounded object to discharge any static electricity from the body.

> ***"This is such a simple construction project that it would be unfair to even consider it a 'weekender'."***

The chips must also be inserted in their sockets properly. Pin one may have a dot beside it, or the chip will have a notch on one end. This is shown in the part layout. If the instructions are not followed carefully, the chip may fail or cause the keyer to die. Some of the chips will have to have the pins straighten out before they can be inserted into their sockets. I place the chips along the edge of my work table, and press down to straighten one side. Turn the chip over and do the other side. Sockets are not necessary for this project, but it sure helps out when it comes to troubleshooting. If sockets are not used, then solder the ICs directly to the board using a grounded soldering iron. Watch that the chips do not get too hot!

After stuffing the printed circuit board, check over the work for errors. Then once everything is the way it should be, connect a 9 volt battery to the keyer. Adjust the speed control to mid range. The output of the keyer is an open-collector transistor. There shouldn't be any trouble keying either a HW-9 or HW-8. Almost all of the newer solid state radios will also key properly without modifications to the basic circuit. Grid block or cathode keying will require the use of an interface between the keyer and the radio.

To test the keyer, just connect up a VOM (set for ohms) to the output and short either the dot or dash paddle to ground. The meter should be seen deflecting. Adjust the speed and notice a change on the meter. Connect the keyer directly to the radio to avoid messing with a VOM. A VOM must be connected properly before the operator can tell if all is well. Some VOMs have the polarity reversed when using the ohm ranges. Just be sure to use a dummy load while testing.

After testing the results, install the circuit board into a suitable enclosure. If the circuit is being installed into a HW radio, double-sided tape will hold the board to an inside case wall. The speed control can be mounted on the rear or the front panel.

Troubleshooting

Oh No! Trouble. Well there is little that can go wrong. Check over the wiring once again and the placement of the components on the board. If all looks good, look at the base of the keying transistor with the probe of the VOM. Close the dot paddle (or dash paddle) and see if the transistor is being turned on. If it is, then there might be a bump 2N2222A or a wiring error from the transistor collector to the radio.

If the base is not seen going high, then look at the clock circuit. If the clock is not running, try replacing the 4011 IC. Check the clock again to see if it is running. The keyer will not work unless the clock is running. If the is clock running, but nothing is coming out of the keyer, swap out the 4027 chip. That should fix things up.

Now for the good part: I have collected together all the parts for this project, including the printed circuit board and IC sockets. Only a 9V battery is needed to finish the project. The cost of the kit, will be $9 postpaid in the USA. I'll throw in a copy of the enlarged parts layout guide. If one of these kits are of interest, don't delay! Only 25 are being made.

The printed circuit boards included in the kit were furnished by Tom Berryhill AB0Q from his

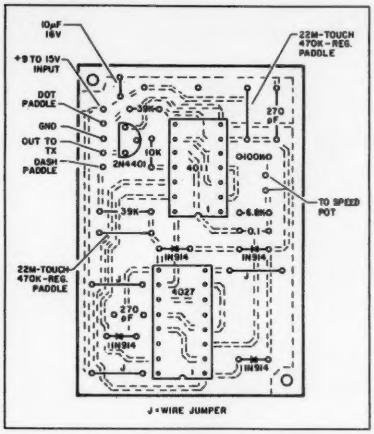

Figure 1. Parts layout from the top side of the board.

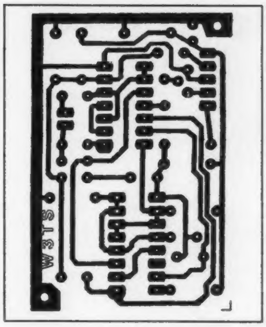

Figure 2. PC board, foil side. (Not to scale)

company Ditek Industries, Inc. Tom also provided the boards for the Two-Fer for me, and those who took up the offer to purchase one of those boards know first hand the quality of Tom's work. Tom is a mover and shaker. A welcome addition to ham radio.

This is one aspect of ham radio that, unfortunately many of us miss out on. Sure, working BY4IY with a microprocessor controlled Japanese made SSB transceiver is great, but some hams are missing out on some of the finest traditional pleasures, challenges, and achievements of our hobby. That's building one's own equipment. People with the talent like Tom Berryhill make it so much easier when the required parts are accessible. Building a TS-940 will not give the same feeling of satisfaction. QRP has put the fun back into the hobby. Not just into operating itself, but in tinkering, building, perfecting, and even in the special friendships between QRPers.

Well that is about all for this month. Next month we'll look at something that everyone has thought about at one time or another: solar power. Coming in September, the antenna issue will surely please those wire-stringers out there.

Sometime later on this year, I'll have details on a trophy I'll give away, the Homebrew DXCC award. Keep those soldering irons hot and watch for the details.

Is your library incomplete? Missing a key article for your QRP project? You can order back issues ($3.95 each) or article reprints ($3.00 for the first, $1.50 thereafter). Send your request to WGE offices.

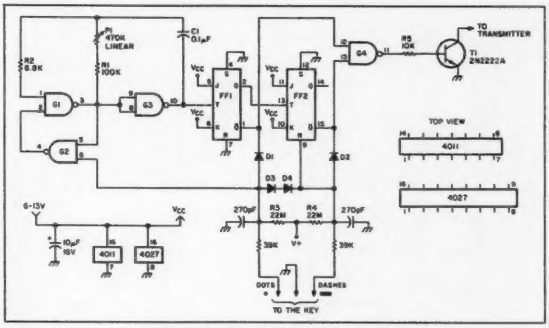

Figure 3. Schematic of the CMOS keyer.

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URBAN ANTENNA RESTRICTIONS

Moving to a new location provides a great opportunity to straighten out the amateur satellite antenna system and put everything together the Right Way. No more old coax, failing relays, noisy rotators, or rusted bolts. Significant improvements, more efficient operation and a clean installation always wait at the end of the rainbow.

The Hunt Begins

Ten years ago, before buying my previous home on the far outskirts of Houston, I checked with the town's architectural committee about antenna restrictions. Their answer was that if my neighbors didn't mind, then they didn't either. No problem. It was a new subdivision and I didn't have any neighbors. HF, hamsat, and satellite TV antennas sprouted all around my yard. No attic antennas here, just aluminum and stainless up in the clear where it belongs.

Several months ago, when the house hunt in Houston began, I naturally requested a room for the radios and space for some antennas. This time, I needed only decent VHF and UHF antennas with a typical multi-band vertical to follow the AMSAT nets.

Having a ham for an XYL (WB5RMA) ensured that I didn't view houses with power lines running through the back, unair-conditioned "hobby shacks" or located next door to another ham.

The radio room was no problem but the antennas became a major concern. Many houses were unsuitable due to the local restrictions and covenants enacted by homeowners' associations and builders worried about property values. One subdivision refused a very small outside two meter and 70cm array, even when the proposal showed that the antenna would never be seen from the street. Due to the hobby, it was impossible to buy the choice house.

The search went on. Our realtor discovered that antenna restrictions were the first concern with area, school district, and the size and shape of the future home taking a back seat. Soon there was a large pile of deed restrictions on the kitchen table dealing with Houston's west side. Friends and co-workers provided suggestions on how to proceed and examples of the covenants from their areas. Some were surprised to find constraints that could preclude virtually any outside structure, including even a small TV antenna. I called the ARRL.

Rules and More Rules

The folks at Newington had a lot of experience with this problem. They were even to cover deed restrictions in the Washington Mailbox column in the April issue of *QST*. They offered to send a copy of the column prior to publication and gave me the callsigns of two lawyer hams in the Houston area available to discuss legal problems with local restrictions. I gratefully accepted the copy offer and proceeded with my antenna problems on my own.

Considering Houston is in the middle of a housing glut, the unyielding attitude of homeowners' associations, whose streets were rampant with foreclosures, astonished us. Surprisingly few subdivisions had acceptable schools, a reasonable commute, and the "ten-foot rule." This last guideline specifies that a homeowner can erect any antenna as long as it is behind the roof ridgeline and does not rise more than ten feet above the highest point on the house.

After some discussion, there were four possible homes. There was, however, a catch—an architectural control committee had to approve all construction, including antennas. I prepared a six-page proposal, showing top and side views of the proposed antennas, their relative position and size on the house, and photographs comparing these antennas with large TV antennas. This package went to the president of the homeowner's association.

Success! The proposed antennas were just a bit shorter than the largest Radio Shack TV antenna, appeared symmetrical, and would mount just high enough to clear any surrounding buildings to have a clean shot to the horizon. The Committee sent its approval in writing just before the closing date. The Purchase and Sales agreement included an antenna approval contingency.

Homework Pays

I was happy with the results, but amateur radio and future satellite chasers are faced with a significant problem. PRB-1 may constrict local municipalities and cities from enacting ordinances against reasonable amateur radio antenna installations, but it does nothing to restrain the actions of homeowners' associations and their deed restrictions. Many hams move into areas expecting few, if any, problems with antennas. Deed restrictions are not even discussed until protest letters arrive from the local organizations after the first antenna has gone up.

Hams who intend to install antennas should check local deed restrictions before they sign an earnest money contract, or else make the contract contingent upon antenna approval. Be prepared to wait for that approval. Although the homeowners' association president graciously cut through the red tape and informally approved our request in three days, it took five weeks for it to come through in writing.

Don't expect to get a copy of the deed restrictions at the closing, or from a real estate agent. Amateur radio operators who intend to pursue their hobby should secure a *complete* copy of any restrictions or covenants for their future home early in the negotiations. Watch the amendments, especially recent ones prohibiting satellite television dishes.

In the course of writing restrictions regulating satellite TV installations, the authors, in many instances, add clauses that directly affect microwave experimentation. Of the nine points listed in the dish guidelines for an area on the far west side of Houston, one, in particular, stands out. It specifies that only normal satellite TV reception shall be allowed. It goes on to state that no transmitting device of any type will be permitted. It's unlikely that anyone in the neighborhood will detect a ten watt 1.2 GHz signal for AMSAT-OSCAR-13's mode L uplink, but it's a violation nonetheless. This rule is typical of the many limitations that have been added to local deed restrictions.

Mode S downlink from the new satellite may not be a problem. The small feedhorn for a four-foot or six-foot dish does not attract much attention if it is painted to conform with other guidelines that define acceptable dish colors (usually black, when specified). Even with careful attention to aesthetics, don't expect to mount any dishes more than a few feet above ground. Most restrictions require that any dish not be visible to public view and not extend higher than ten feet above the grade level of the lot.

Until the FCC addresses the covenants, conditions and restrictions associated with private organizations, hams need to be careful. It's one thing to have a wire dipole in the trees for casual HF activity, but those hams who want to expand to serious DX, VHF or UHF operations may run up against the wall of homeowners' association and deed restrictions.

Updates

The hamsats in orbit as of this writing have performed very well. AMSAT-OSCAR-10 was made available for guarded use in mid-May. Activity may continue through July or August depending on the battery condition. Keep the power levels down and adhere closely to the schedules announced on the AMSAT nets and published in the Amateur Satellite Report.

Fuji-OSCAR-12 has operated satisfactorily with schedule updates every month, while RS-10/11 has been running mode A-K via the RS-11 unit. The K transponder using 15 meters up and ten down has been inactive for short periods, while the A transponder with its two-meter uplink and ten-meter downlink has been on continuously. I have had excellent results on many passes using 50 Watts to a Larsen mag-mount in the attic on two meters, and a longwire around the eaves of the house with a homebrew MOSFET preamplifier for ten meters.

The new OSCAR, A-O-13, known previously as Phase 3C, may already be in orbit by the time this issue goes to press. Check the nets and conversations on the older satellites for information. Even without delays, they won't allow operation until all systems on board A-O-13 are checked out, the satellite has achieved proper orbit, and spacecraft orientation is under control. This process requires a month.

Check those deed restrictions and get ready for some really exciting satellite chasing. ■

Number 33 on your Feedback card

SPECIAL EVENTS

Ham Doings Across the World

BYRON MI
JUNE 18

The Independent Repeater Association is sponsoring its annual hamfest at the National Guard Armory from 8 AM to 4 PM. Free tables (make reservations) for dealers and sellers. Door prizes. Talk-in on 147.165/.765. Write or call *The Independent Repeater Association, 562 92nd St. S.E., Byron Center MI 49315; 616-455-3915.*

HARROGATE ENGLAND
JULY 2-4

The folks who brought you GB75USA, the Darley Amateur Radio Club of North Yorkshire, will operate GB4JUL as part of a joint US-UK celebration of American Independence Day. Operations will include all HF and VHF bands through 23cm and possibly Phase 3C, if the satellite is available for general use. QSL via G0FWG or the *Darley Amateur Radio Club, MHS, Harrogate, N. Yorks., England HG3 2RF.*

ARVADA CO
JULY 2-3

The Colorado Six Meter Invitational Net is sponsoring a contest from July 2 at 1400Z to July 3 at 0300Z. Exchange callsign, first name, grid square, S.I.N., if any (S.I.N. members, 3 points, nonmembers, 2 points) on 50 MHz. Score obtained by multiplying number of states worked by the number of points logged. First and second place winners receive certificates. Send logs including date and time of QSOs by July 31 to *N0AKI, 8529 Fenton St., Arvada CO 80003. SASE appreciated.*

BRIDGEPORT WV
JULY 2-3

The West Virginia State Hamfest and ARRL Convention will be at the Jackson's Mill State 4-H Camp near Weston. Admission, $4. Talk-in on 145.39/4.79. For more information, contact *Hal Tate N8FXH, 121 East Olive St., Bridgeport WV 26330.*

CHATHAM ONTARIO
JULY 2-3

The Chatham Kent ARC will operate VE3CRC on the above dates from the 1988 FESTIVAL OF NATIONS to celebrate the variety of ethnic cultures in Chatham and Canada. Phone frequencies: 3.875, 7.240, 14.250, 21.360, 28.340. CW: 3.450, 3.725, 7.045, 7.125, 14.030, 21.090, 21.125. FM: 147.720/147.120 VE3KCR. For certificate QSL, contact *VE3CRC, Chatham Kent Amateur Radio Club, Inc., PO Box 284, Chatham Ontario CANADA, N7M 5K4.*

DEFIANCE OH
JULY 2-3

The Defiance county ARC will operate K8VON from 1600Z–2200Z from Historic Fort Defiance in celebration of the Defiance Flowing Rivers Festival. Suggested frequencies are 10–40 meter phone and CW bands. For certificate send a 9x12 SASE to *DCARC, Inc., Box 494, Defiance OH 43512.*

HANNIBAL MO
JULY 2-3

The Hannibal ARC, Inc., will operate W0KEM and issue it's annual special events certificate celebrating the National Tom Sawyer Days. Suggested frequencies: 7.240, 14.255, 21.340, and for Novices, 28.400. Send large SASE and personal QSL card to *Hannibal ARC, Inc., W0KEM, PO Box 1522, Hannibal MO 63401-1522.*

WILKES-BARRE PA
JULY 3

MURGAS ARC K3YTL is sponsoring its 9th annual Hamfest and Computerfest with an Ice-A-Rama at the Coal St. Sports Complex. VEC exams, large outdoor flea market ($3 per space), indoor space with tables available via advance reservation ($7.50 per space, $9 at door if still available). Admission $3. Talk-in on 146.61—53.61—146.52. For more information, contact *Jim Post KA3A, 15 Monarch Rd., Wilkes-Barre PA 18702; 717-825-3940.*

THOMPSON OH
JULY 4

KD8FJ will operate its 4th annual Heritage of Our Country, from Heritage Hill Camp in Thompson OH. Operation will be on 40 and 80 meters, lower end of phone band, and on 10 meters, 28.450. A large certificate is available for an SASE from *KD8FJ, 386 Cedarbrook Drive, Painesville OH 44077.*

STAUNTON VA
JULY 4-5

The Valley ARA will operate N4ICT with the Statler Brothers Happy Birthday USA beginning July 4 at 1200Z to July 5 0030Z. Phone frequencies: 3.855 MHz, 7.280 MHz, 14.250 MHz, and 28.375 MHz. Send QSL, contact number, and 9x12 SASE for certificate to *Valley ARA, PO Box 666, Staunton VA 24401.*

TORRINGTON WY
JULY 4-5

High Plains ARC will operate KB7KU at Historic Fort Laramie from 0000Z July 4 until 0000Z July 5. Phone frequencies: 3.850, 7.250, 14.250, 21.360 and 28.550. CW: 50 kHz up from lower band edge. QSL for business size SASE to *KB7KU, 3642 Bighorn, Torrington WY 82240.*

PEACE GARDENS ND/CANADA
JULY 7-10

Celebration of the 25th anniversary of the International Hamfest will be held in the Peace Gardens on the Manitoba, Canada and North Dakota, USA border from 9 AM CST to 9 PM CST July 7, 8, and 9, and from 9 AM CST to noon on July 10. Frequencies are 1.900, 3.885, 7.230, 14.230, 21.330, and 28.330. To receive the Peace Garden Award send a QSL and 3 IRC with SASE to *VE4XN, Dave Syndal, 25 Queens Crescent, Brandon, Manitoba CANADA R78 1G1.* To receive a QSL send a QSL card and one IRC with SASE to *KA0SLI, John Swanke, PO Box 304, Lakota ND 58344.*

SABA ISLAND
JULY 7-14

6 M DX Society members Mario Karcich WB2CZB, Jim Holt N3AHI, and John Laing W1EXC, are manning an expedition to Saba Island. Callsign PJ0M, operation on all bands, 80 through 6, SSB and CW. Equipment: an FT757, two TS680s and amps, wire antennas on HF and 3 & 5L beams on 6. Members will explore 6 M multi-hop paths to the UK, Europe, and Americas. WB2CZB, member of QRP ARC International, will actively solicit QRP contacts. SASEs, please. QSLing is via *Mario K2MUB.*

SUMMERLAND BC
JULY 8-10

The Okanagan Ham-Fair Society is sponsoring its annual Ham Fair at Illahie Beach RV Park in Summerland from 4 PM Friday to 4 PM Sunday. Flea market, auction, new equipment, surplus, seminars, packet, repeaters. Admission, $5. Talk-in on 146.34/.94 or 146.52. Call *Glenn Borgens VE7GSB at 604-492-5684 or VE7BEE at 604-493-1122* or write *Okanagan Ham Fair, Box 477, Penticton, BC CANADA V2A 6K6.*

ALTOONA IA
JULY 9

The Des Moines Radio Amateur Association is sponsoring Hamfest '88 at the Adventureland Inn in Altoona. Admission is $4 in advance, $5 at door. Indoor commercial exhibit tables are $40 for the first table and $35 for additional tables. Indoor flea market tables are $5 each. VEC testing, seminars, free tail-gater flea market. Talk-in on 146.34/.94 and 440.5/445.5. For more information, write *Hamfest '88, PO Box 88, Des Moines IA 50301* or call *Jim Zellmer KA0VSL, 515-276-8949.*

BURLINGTON ONTARIO
JULY 9

The Burlington ARC invites all hams within driving distance to the 14th Annual Ontario Hamfest at the Burlington Central Arena from 8 AM to 5 PM. 180 fleamarket tables, computer/ham exhibits, packet forum, and the usual Superevent. Talk-in on 21/81 and 52 direct. $5 at door, $3.50 pre-registration. For details, write *Ontario Hamfest, PO Box 836, Burlington ON CANADA L7R 3Y7.*

OAK CREEK WI
JULY 9

The South Milwaukee Amateur Radio Club will hold its annual Swapfest as usual at the American Legion Post #434, 9327 S. Shepard Ave., Oak Creek WI 53154. Admission $3, prizes, exams, talk-in on 146.580 MHz FM Simplex. For details, write *The South Milwaukee Amateur Radio Club, PO Box 102, S. Milwaukee WI 53172-0102.*

INDIANAPOLIS IN
JULY 9-10

The 18th annual State ARRL Convention and Hamfest will be at the Marion County Fairgrounds. New equipment and computer wholesale dealers, supplies, home-brew components and hardware, flea market, technical forums all day Saturday, ARRL forums all day Sunday. Awards presented. Gate fee, $5. Children under 12 free. For information on inside flea market space, call *317-356-4451*. For information on commercial building space, call *317-745-6389*.

LAKE CANTON OK
JULY 9–10

Oklahoma amateur radio operators will conduct annual Field Day exercises at the Big Bend picnic shelter. The Field Day is held in conjunction with the annual IARU "Radiosport" DX Contest. Simulated emergency operations, QRP contacts, solar power, and camping. Commemorative certificates for contacts with event stations WD5HPU, WA5LTM, and others from Lake Canton. Phone frequencies: 40/20/15/12/10 meter bands, and 6 and 2 meter SSB. Talk-in frequencies: 146.52 simplex, and the Fairview OK repeater, 144.85/145.45. I-40 travelers should use the Calumet OK repeater, 146.01/146.61. Send QSL and large SASE for certificate, or for more information, contact *Tim Mauldin WA5LTM, Lake Canton Field Day, PO Box 19097, Oklahoma City OK 73144; 405-682-2929.*

BELGRADE LAKES ME
JULY 9–11

The third annual World Emergency Communications Conference will be held at Woodland Camps, Belgrade Lakes ME on the above dates. For reservation information, contact *Betty Grant, IARN, Belgrade Lakes ME 04918; 207-495-2251.*

BATAVIA NY
JULY 10

The 8th annual Batavia Hamfest, sponsored by the Genesee Radio Amateurs, will be at the Alexander Firemen's Grounds. Indoor commercial exhibits, spacious flea market, VEC exams, breakfast and BBQ. Ticket $3 before July 1, $4 at the gate. Talk-in on 144.71/145.31 and 146.52. For more information, contact *G.R.A.M., POB 572, Batavia NY 14021*. For tickets, write *Knute Carlson N2DRX, 26 Burke Dr., Batavia NY 14020.*

BOWLING GREEN OH
JULY 10

The Wood County ARC is sponsoring its 24th Annual Ham-A-Rama at the Wood County Fairgrounds. Free admission. Doors open 8 AM to 4 PM. Talk-in on 147.18/.78 and 146.52. Tables $7, trunk sales $3 per vehicle width. For more information, contact *Jim Davis N8DWR, 10990 Newton Rd., Bowling Green OH 43402; 419-352-3321.*

DOWNERS GROVE IL
JULY 10

The DuPage ARC is sponsoring a Hamfest/Computer Show at the American Legion Post 80 with outdoor flea market and swappers row. Indoor tables available, dealers welcome. VEC exams (bring copy of license). Admission $3 at gate, $2 in advance. Talk-in: 146.52, 145.250–600, 224.55, and 442.55. For tickets or tables, send SASE to *Hamfest Chairman W9DUP, PO Box 71, Clarenoon Hills IL 60514; 312-985-0527.*

DUBLIN, IRELAND
JULY 10

The Millennium Birthday of Dublin will be celebrated by amateur radio operators from the heart of Viking Dublin on the unique callsign EI-1000. The Phoenix Park will host the city's birthday celebrations. A special QSL card will be available via the IRTS bureau or upon receipt of 3 IRCs. For further information, contact *Shane Halpin, D.M.A.R.C., 25 Knocknashee, Goatstown, Dublin 14 IRELAND.*

PITTSBURGH PA
JULY 10

North Hills Amateur Radio Club is sponsoring its 3rd Annual Hamfest at the Northland Public Library. Admission, dealer, and flea market space are all free. VEC exams, ARRL table, wheelchair accessible. Talk-in on 147.09. For Hamfest information, contact *Bob Ferrey, Jr. N3DOK, 9821 Presidential Dr., Allison Park PA 15101; 412-367-2393*. For VEC information, contact *John Rosenwald NM3P, 400 Stevens Dr., Pittsburgh PA 15237; 412-931-2631.*

GLACIER-WATERTON MT
JULY 15–17

The 54th annual Glacier-Waterton International Hamfest, sponsored by the Flathead Valley ARC will be at Three Forks Campground on the southern edge of Glacier National Park. Activities include 2 meter bunny hunts, QCWA meeting, seminars, contests, auction, swap tables, dealer displays, exams. Talk-in on 146.10/.70 and 146.52. For further information, contact *Flathead Valley ARC, PO Box 2549, Kalispell MT 59901 or Harold Schneider W7BKM; 406-862-4962.*

PETOSKEY MI
JULY 16

The Straits Area Amateur Radio Club will have its 13th Annual Swap Shop at the 4H Building on the Fairgrounds. Admission $2.50, tables $3, door prizes. VCR raffle tickets. Talk-in on 146.08–68 or 52. For more information, call *Irene at 616-539-8986, or Clark at 616-582-6455.*

WAPAKONETA OH
JULY 16–17

The Reservoir ARA will operate K8QYL from 1300Z to 2000Z on the 16th and 1600Z–2000Z on the 17th from the Neil Armstrong Air & Space Museum to commemorate the 19th anniversary of Armstrong's walk on the moon. Operation will be on 40 meters, phone, CW, RTTY, and Novice 10 meter phone. *John Prendergast WB8PEW.*

FAIRBANKS AK
JULY 16–24

Special event station KL7KC will commemorate during Golden Days the discovery of gold by Felix Pedro. Operation on CW and phone in the 10, 15, 20, and 40 meter bands. For QSL send SASE to *KL7KC, PO Box 81389, Fairbanks AK 99708-1389.*

AUGUSTA NJ
JULY 17

The Sussex County ARC will sponsor SCARC '88 at the Fairgrounds on Plains Rd. Registration $3, indoor tables $7 each. Tailgate space, $5. For further information, contact *Don Stickle K2OX, Weldon Rd., RD 4, Lake Hopatcong NJ 07849.*

FLUSHING OH
JULY 17

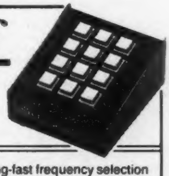
The Triple States Amateur Radio Club will hold its 10th annual Wheeling Hamfest/Computer Fair at Wheeling Park. Dealers welcome, big flea market, family activities. Admission $3 in advance, $4 at door. To reserve space, contact *Sandi Williams KB8AAV, 9 East High St., Flushing OH 43977; 614-968-3652*. For tickets, contact *TSRAC, Box 240, RD 1, Adena OH 43901; 614-546-3930.*

WASHINGTON MO
JULY 17

The Zero-Beaters ARC is sponsoring their 26th Annual Hamfest at the Bernie H. Hillermann Park. Free admission. Flea market parking $2. Talk-in on 84/24 and 52. FCC exams (bring license and copy). For more information, call *Al Lanwermeyer WB0QBS at 314-239-2072.*

INDIANAPOLIS IN
JULY 20–24

All amateurs are welcome to participate in the County Hunters' 20th annual convention at the Ramada Inn. The Indianapolis Zoo and 500 Motor Speedway will highlight the week. The Saturday banquet will begin at 7 PM with awards and major prizes. For information and registration, send an SASE to *Herb Morgan WD9GBH, 735 East 50th Street, Marion IN 46953.*



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LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus CA 91350

Ponderings at 39,000 Ft.

It's just before midnight EST and most of the passengers aboard this westbound Boeing 767 are sleeping. We are about two hours from Los Angeles, and I've spent most of my time since leaving Dayton musing over the events of the past three days. One highlight was the surprise appearance of former FCC Special Services Division Chief Raymond A. Kowalski.

Ray quit his job with the FCC last December to join a Washington law firm. During his term, he was involved in many important rules interpretations and decisions, many which benefitted amateur radio. His "going-away present," however, did the service harm. The now infamous "Kowalski Letter" permitted the establishment of multiple repeater coordination entities serving the same geographic and demographic areas.

This letter brought him to Dayton and the third annual National Repeater Coordination Conference on the last Saturday of April. Ray felt he had an obligation to let those who coordinate repeaters know where they really stood in the eyes of the FCC, and now, in the private sector, he was free to say what he wished. What follows is the first part of an excerpted version of his 25 minute talk to over a hundred people, who represented repeater coordinators in most of the 50 states and several Canadian provinces.

What Ray Really Thinks

"...I probably won't be back to the Dayton Hamvention after this year, but I couldn't walk away without sharing with you what I've learned during my term with the Commission over the last five years. These are purely personal observations.

"...I think that lawsuits are completely out of place in amateur radio. I would hope that those who may be involved in them...would step back a little bit and see if there isn't a better way to accomplish what they are after in amateur radio...The legal fees are horrendous, and I pity anyone having to pay them. However, it's my personal view that lawsuits are the logical and natural result of the position the FCC placed ham radio in.

"...If I were in the current market and environment in amateur radio, especially in repeater coordination, I would be doing my damndest to push the FCC to change the ground rules!"

Double-Edged Sword

"...Ham radio's greatest strength—volunteerism—is also its greatest weakness. Many hams have come forward to do onerous and thankless jobs—such as repeater coordination and band planning. Unfortunately, these actions have no recourse in law or regulation, for they are, in essence, 'gentlemen's agreements.'

"...The problem is that amateur radio is starting to see people exploiting that. The autonomy of amateur radio allows the few self-serving hams to impose that much more on the honest and charitable majority.

"Why is this happening? Apart from the nature of ham radio, as described above, this Service, like many others, was deregulated five–six years ago. The idea was to let the marketplace regulate what goes on in radio to the greatest extent that it can and let the FCC get out of the business of regulating. The FCC applied that philosophy across the board in all radio services, including amateur radio.

"I hope that some of you will go back and reread my interview in *CQ Magazine* when I was first appointed to the Commission. I said there that deregulation wouldn't work in amateur radio. There's no marketplace force, no competitive engine that drives amateur radio. What must serve in place of a marketplace for amateur radio is regulation.

"Most people shudder at the thought of more regulation—it's not the American way to invite more government interference. But this is exactly what amateur radio needs—the Service has more autonomy than it can adequately cope with.

"Amateur radio has an absurd licensing situation when it comes to repeaters. The model of amateur radio regulation is based on point-to-point communications. Repeaters ostensibly merely extend the distance between those points. They are akin, however, to land mobile or broadcast station operations because of the tremendous range that repeaters have. One of the reasons repeater coordination presents so much trouble is that it doesn't fit the regulations that generally govern amateur radio.

"I sat in on a repeater coordinators' meeting this morning and saw that most of the attendees had immediate issues to attend to in their local clubs. Hams must make every effort, however, to step back and look at the big picture. They need to see that there's something different about repeater coordination that requires a different regulatory approach." ■

Look for the continuation of Kowalski's speech in next month's Looking West.

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Islands On The Air

Looking for a new DX challenge this summer? Many DXers are finding the Great Britain-based Islands On The Air (IOTA) program an exciting addition to their quest for DXCC and Worked All Zones.

The IOTA program involves working and confirming stations located on more than 400 islands and island groups in all corners of the globe. Like DXCC, the initial award level is for 100 islands, with additional awards at 2, 3, and 400 levels. The IOTA program includes 11 other awards, most for working 75% or more of the activated islands in each geographic region. These latter awards cover the six continents, Antarctica, Arctic islands, the West Indies, and the British Isles. (In regions with more than 100 activated islands, the DXer can earn the award by confirming 75 islands.) To qualify for the IOTA World Diploma, the DXer must confirm 50% of the activated islands in each of the seven continental areas.

> ***"Any recognized island, island group, or subgroup, as listed in the National Geographic Society's World Atlas can receive an IOTA designation."***

Geoff Watts founded the IOTA program in the mid-1960s. Since 1985 the Radio Society of Great Britain (RSGB) has administered the awards, under the supervision of Roger Balister G3KMA. (Geoff Watts, by the way, is a British short wave listener who edited the weekly *DX News Sheet* in England for many years, the only non-ham member of the DX Hall of Fame.)

The Appeal

The Islands On The Air program appeals to DXers for two main reasons. First, the program provides a new challenge to the DXer who is running out of countries to work under the DXCC program. With hundreds of islands to chase, the DXer will not run out of potential IOTA credits for many years. The other primary appeal of the program is that almost any DXer can be DX, by operating from one of many IOTA islands.

Island DXpeditioning is very popular among EuropeanDXers—so popular in fact that the IOTA administrators have stopped accepting applications for new islands in Europe. (The latest IOTA directory lists 110 European islands!) DXers can get to many of these islands by automobile, commercial transportation, or a short boat ride. Since many of the islands don't have resident amateurs, the only time a DXer can make contact with an island is via an island DXpedition. The summer months see many such mini-DXpeditions by hams from almost every country in Europe.

Most such trips are single weekend affairs, with a simple transceiver and portable antenna, a far cry from the elaborate, time-consuming, and expensive DXpeditions to rare DXCC locations, such as Howland Island or Kingman Reef. The ease with which a DXer can activate an IOTA island is a major benefit of the program.

North American Islands

What counts for IOTA? Any recognized island, island group, or subgroup, as listed in the National Geographic Society's World Atlas can receive an IOTA designation. To simplify IOTA hunting, the IOTA administrators provide an IOTA Directory that lists some 600 possible IOTA credits. In North America, the directory is available for US $3 postpaid from *The DX Bulletin*, Box 50, Fulton CA 95439.

Among the IOTA credits on the Atlantic coast of the United States are: Mount Desert Island in Maine (NA-55), Nantucket (NA-46), Block Island (NA-31) off Rhode Island, Long Island (NA-26), the Chesapeake Bay (NA-83) and Hattaras (NA-67) groups, Sea Island (NA-58) and Cedar Key (NA-76), and the Florida Keys (NA-62). In the Gulf of Mexico, there's Florida's Marco Island (NA-52), Sanibel group (NA-69), Tampa Bay peninsula group (NA-34), Ship group (NA-82), and Chandeleur Island (NA-??). On the West Coast IOTA, credits are the Channel Islands (NA-66), the Farallons (NA-??), and the San Juan Archipelago (NA-65). IOTA does not assign a number to an island until it is "activated" by an accredited operation.

These islands show the wide range of available IOTA credits. For example, a IOTA DXer can drive to many of these islands, such as the Florida Keys, Marco Island, Mt. Desert Island, Long Island, and the Hattaras group. Others are a short ferry ride away: Channel Islands, Nantucket, Block Island, and the San Juans.

On the other hand, some of the islands within a few miles of the US coast have never seen IOTA activity. They fall into the "inactivated" group. These 200 or so islands that will count for IOTA, once an IOTA DXer operates from that island. The St. George group on the Florida panhandle has not been on the air for IOTA, despite regular ferry service. Other potential IOTA credits off the US coast have not been on the air for very good reasons. For example, the Marquesas group off Key West, and the Farallons near San Francisco are wildlife refuges. Authorities are reluctant to approve DXpeditions among nesting birds and sea life.

A more adventuresome DXpeditioner can find many more IOTA islands in North America. Canada has 25 activated and inactivated IOTA credits. The more common islands include Newfoundland (NA-27), Cape Breton (NA-10), Prince Edward Island (NA-29), and Vancouver Island (NA-36). The islands that have not yet seen IOTA activity are all rather inaccessible: islands in the Hudson Bay, and Akpatok Island in the Arctic.

Alaska has 24 potential IOTA credits, only 14 of which have been on the air. Anyone for a DXpedition to Walrus Island this summer? One Alaska IOTA credit of particular interest is thePribilof group (NA-28). The Alaska DX Association tried for years to get the Pribilofs added to the DXCC country list, without success. At least the Pribilofs count as a New One for IOTA.

An interesting wrinkle to IOTA is that some islands that count separately for DXCC are lumped together into a single IOTA credit. For example, the Diomede Islands in the Bering Strait count as a single IOTA entity (no number yet assigned), but two DXCC countries: Alaska KL7 and Asiatic RSFSR UA0. Similarly, many of the Caribbean DXCC countries are lumped into the Windward Islands (NA-25), the Leeward Islands (NA-22), and the Greater Antilles (NA-15). Thus Montserrat VP2M, AnguillaVP2E, Antigua V2, Dominica J7, Guadeloupe FG, and others all count for NA-22, despite separate DXCC status.

To get started in the IOTA program, try tuning in the IOTA net on 14260 kHz at 1300Z on Saturdays. Most IOTA DXpeditions try to hit this spot, and many IOTA regulars will be pleased to provide information for the new island chaser. DXers can find details on future IOTA DXpeditions in RSGB's *DX News Sheet*, or in some of the weekly stateside DX newsletters. Meanwhile, look through those QSLs for possible island confirmations, and set up a check sheet for IOTA credits confirmed. Finally, consider an island DXpedition this summer!...de VP2ML NA-22.

> ***"An interesting wrinkle to IOTA is that some islands that count separately for DXCC are lumped together into a single IOTA credit."***

[Don't miss the 1988 Northwest DX Convention July 22–24, at the Richmond Inn, Richmond, British Columbia. Registration is US $40 to the sponsoring British Columbia DX Club, c/o Ken Thompson, Box 3048, Blaine WA 98230.]

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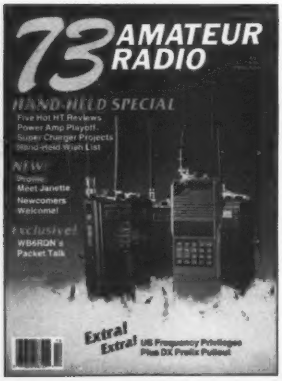
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2	Conversion Data	May 77
3	Radio Shack TRC-47	Jul 77
4	E.F. Johnson Messenger 123A	Jul 77
5	Hy-Gain 670B	Jul 77
6	Antenna Suggestions	Dec 77
7	Radio Shack Realistic TRC-II	Dec 77
8	The Publicom I	Feb 78
9	How about SSB Conversions?	Jul 78
10	Radio Shack TRC-11 and TRC-74	Aug 78
11	Radio Shack Realistic Mini 23	Sep 78
12	Hy-Range 681A (Hy-Gain)	Sep 78
13	Kraco KCB-2310B	Oct 78
14	Lafayette Telsat SSB-75	Nov 78
15	Radio Shack Realistic TRC-452	Nov 78
16	CB Walkie-Talkie Conversion	Nov 78
17	Sharp Model CB-800A	Jan 79
18	SBE Sidebander III and Pace 123A	Jan 79
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20	Lafayette SSB-75 and SSB-100	Jun 79
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23	CB to 10 FM - Part I	Jan 80
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30	New Life for SSB CB Rigs	Jul 80
31	Double Your Channels in SSB Conversions	Jul 80
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34	Peaking and Tweaking Hy-Gain Boards	Mar 82
35	CB to CW? (Hy-Gain)	Jul 82
36	Maximum Modulation for CB Conversions	Dec 82
37	Beef Up Your CB-to-CW Conversion	Feb 83
38	Add a Digital Readout to Your CB Conversion	Feb 83

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FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column are listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and Larry (our editor-in-chief) takes a good, hard look at what you do and don't like. To show our appreciation, we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*. To save some money on stamps, why not fill out the Product Report card along with the Feedback card and place them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents.

Feedback#	Title
1	Welcome, Newcomers
2	Never Say Die
3	QRX
4	Code Test Sure Shot
5	Review: Yaesu FT-747GX
6	2 Tone Encoder
7	Novice Band Code Nets
8	Review: GGTE Morse Tutor
9	How To Improve Code Speed
10	Direction Finding Loop
11	Morse Code Motivation Techniques
12	DTMF Hornblower Two
13	Review: Datong's Great Add-On Filters
14	You Will Upgrade!
15	Review: Gordon West Novice Course
16	Review: AR-460D 3½ Digit LCR Meter
17	A Pulsed Bi-Phase Communications System (Part 2)
18	How Not to Run a Novice Class
19	Flip Flop Latch Circuits (Part 2)

Feedback#	Title
20	Dealer Directory
21	Problems in Learning the Code
22	Security Alert
23	Care and Feeding of PBBS (Part 2)
24	Weathersats
25	Above and Beyond
26	RTTY Loop
27	ATV
28	Aerial View
29	New Products
30	QRP
31	Index: 7/88
32	Hamsats
33	Special Events
34	Looking West
35	DX
36	Ad Index
37	73 International
38	QTH DX
39	Propagation
40	Barter N Buy

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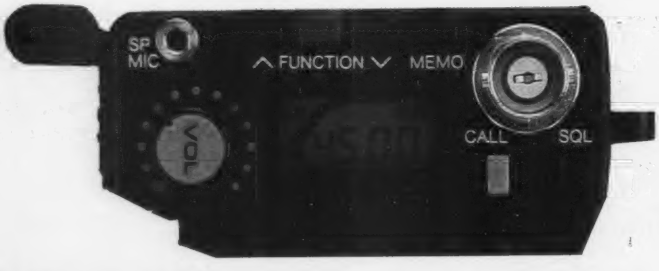

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73 INTERNATIONAL

edited by Richard Phenix

Notes From FN42

Last month we noted that the International League of Amateur Radio Esperantists has a membership of over 350, that 18 of the 80 nations represented at a world conference last year had representatives in the ILARE, and that 162 stations in 22 nations participated in the annual international contest in Esperanto (on the HF bands, third weekend in November). That gives you four months to learn the language before this year's contest, and here is how you get started.

Send a business-size SASE (use IRCs if you write from outside the U.S.) to ***Esperanto STI, 195 Partridge Road, Pittsfield, MA 01201, U.S.A.*** *and accept a 10-free-lessons offer! You get one lesson at a time, sending in your work on each, with SASE (or SAE with IRCs) to get the next one. You will be put in touch with the Esperanto center nearest to you. "Dankon," (Thank you) say you? "Ne dankinde!" (Don't mention it; you're welcome!)*

Esperanto is about 100 years old. Each of its 28 letters is always pronounced the same way, words are spelled as they sound, and are "grammar coded." Nouns end in O, adverbs with an E, adjectives with A, and verbs with AS (present tense), IS (past), OS (future). "The" is always la, for singular, plural, object, subject (no word for "a" or "an" and there is no masculine or feminine for inanimate objects, as in many languages). There are 16 fundamental rules of grammar, with NO exceptions.

We already have one common language: Morse code. What great communications would take place if we could speak to each other all around the world! Esperanto, which is neutral on all matters of politics, economics, and religion, already has a worldwide presence—an estimated eight million read, speak, and write it—and an extensive literature—prose, poetry, technical matters, etc. Easy (facila) to learn; not difficult (malfacila).

We are indebted to Allan C. Boschen, a former Director of the Esperanto League for North America, for the above. He is an electrical engineer and has both taught and worked in his profession. He is a Senior Member of the IEEE.

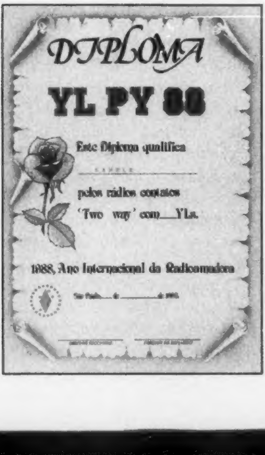
July dates: This is a great month for Independence! It is Independence Day for the USA on the 4th, for Venezuela on the 5th, Argentina the 9th, the Bahamas on the 10th, Colombia on the 20th, Liberia on the 26th, and Peru on the 28th. Viva!

Canada Day is on the 1st; 6—National Day, Malawi (17th is National Holiday, Iraq, and for Belgium on the 21st); 14—Bastille Day, France; 18—Liberation Day, Nicaragua (National Liberation Day, Poland, the 27th); 19—Martyas Day, Burma; 23—Revolution Anniversary, Egypt (31st for the Congo); 24—Aniversario de Bolivar, Latin America; and Cuba celebrates National Rebellion Day on the 26th.

Roundup

Africa. Wayne had a newsy letter from 5Z4BH (a new call) in Nairobi, in which 9X5AA and 5H3ZO are mentioned, along with casual references to Kigali, Ethiopia, Somalia, Djibouti, Tanzania, and Dar Es Salaam.... This column would welcome items from those parts of the world. Let's hear from you.

Brazil. From LABRE/São Paulo Executive Secretary João Iva da Fonseca Netto (PY2OT): The YLPY88 Award, for working PY "YL" stations during 1988. All bands, CW or phone, also available for SWLs, QSLs not required, only GCR log info: date, call, time, mode, RS/T band. CW contacts are worth 11 points; phone contacts are 8 points; 88 points are needed. Send application with 10 IRCs to LABRE DS/SP—YLPY88, PO Box 22, São Paulo - CEP 01051, Brazil.



DIPLOMA

YL PY 88

Este Diploma qualifica

SAMPLE

pelos rádios contatos
'Two way' com__YLs.

1988, Ano Internacional da Radioamadora

British West Indies. Roger Corbin ZF1RC and Bruce E. Miller ZF2KN are now, respectively, president and secretary/treasurer/QSL Manager for the Cayman Amateur Radio Society. Address for the latter: PO Box 1029, Grand Cayman Island, BWI. And he reminds us that the 12, 17, and 30 meter bands are not authorized for use in the Cayman Islands, and 160 operation is limited in power to 75 W for class A operators and 20 W for class B operators.

France. More and more references to packet. "I think you would be interested in knowing that French packet amateurs are making lots of QSOs...and plan to set up nets, as in California and elsewhere stateside. Contacts between Sweden, Spain, British Isles, Germany, Malta, and Sardinia are common [and] even behind the Iron Curtain...Poland and Yugoslavia." So writes SWL Jean R. Boucton F11DPM. [*How about writing us a page or two on "Packet Radio In France," or some such title, for use sometime in this column?—Ed.*]

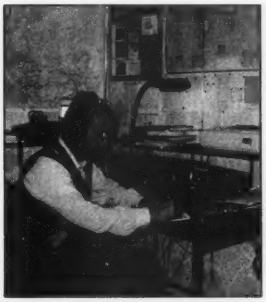


Photo A. John F11DPM.

World. From time to time it is good to remember there is (and has been, for 123 years) a membership organization, now 163 countries strong and now a specialized agency within the United Nations, called the International Telecommunications Union (ITU). Among its many sub-groups is the World Plan Committee—which met in Portugal last February under the chairmanship of C. R. Crump (of the USA). It receives reports from countries on their respective trends in planning activities, developments, and data on past, present, and projected volumes of telecommunications traffic.

Also in February, in association with the Department of Telecommunications of India, the ITU brought together over 100 representatives from 42 Asian and Pacific countries to plan a Regional Development Conference. The conference focus: the implications of the prediction that "by the early part of the next century, virtually the whole of mankind should be brought within easy reach of a telephone and, in due course, the other services that telecommunications can provide." [*Meaning us, among others.*]

In May there was the Americas Telecom exhibition and forum in Rio de Janeiro and a policy symposium on development strategies for Latin America. May 17 annually is World Telecommunications Day, and this year's subject was "the transfer of technological know-how in the age of electronics." Its purpose was to focus attention on the roles of modern telecommunications in the economic and social development of nations.

Between late August and early October this year there will be a World Administrative Radio Conference in Geneva on the use of geostationary-satellite orbit and on the planning of space services utilizing it. In October of 1989, Geneva hosts the World Electronic Media Exhibition and Symposium.

Heady stuff that affects hams worldwide, eventually. If you are interested in more details, write the ITU, Place des Nations, CH-1211 Geneva 20, Switzerland. You may request that information come to you in English, French, or Spanish.

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

[Jim headed this latest report on EXPO88, "APOLOGY." He owes us none...it was an army of Murphys (Murphies?) who do. Mix together bureaucracies (which every nation has) and our magazine lead time and you come up with Jim's report in the April issue. It was overtaken by Murphy events in late March in Australia, far too complicated to describe, but be-

NATIONAL CAPITAL CERTIFICATE RULES

All amateurs and SWLs worldwide are eligible. Contacts (SWL reports) valid from 1301 UTC December 31, 1987 to 1300 UTC December 31, 1988.

POINT REQUIREMENTS

Category	Section	Points Required
1. HF (Under 30 MHz)	VK Call Areas (not VK9/VK0)	50 Points (incl. VI88ACT)
2. HF	Non-VK Call Areas (incl. VK9/VK0)	20 Points (incl. VI88ACT)
3. VHF+	VK Call Areas (Above 30 MHz)	50 Points (not VK9/VK0)
4. VHF+	Non-VK Call Areas (incl. VK9/VK0)	8 Points

Each application in Categories 1, 2, and 3 must include at least one of the Australian VI88 special event callsigns. Those for HF must include a contact with VI88ACT.

HF contact with any Australian callsign = 1 point; with any VI88 special event callsign = 5 points.

VHF contacts between stations up to 30 km. = 1 point; and over 30 km. = 4 points. Contact with any Australian VI88 special event callsign counts for 10 points, i.e., VI88ACT or any other VI88 prefix.

For VK operators only: Except for the VI88 special event callsign, all contacts must be outside area operated from.

Any VI88 special event callsign may be claimed only once per band per mode. (E.g., VI88ACT on 20m SSB and 20 CW = two contacts—10 points, because of different modes.)

QSL card confirmation of contacts claimed not required.

Any band or mode within the terms of the applicant's license is accepted; endorsement requests will be considered. E.g., if all points claimed are for contacts on a single band or mode, an endorsement to the Certificate would be possible.

Contacts made by any terrestrial voice repeater method are not valid. Packet radio contacts using digipeater(s) are valid.

Send Aus.$4.00 or 7 IRCs with your application; send logs or log extracts for each contact claimed, with callsign, date, UTC time, mode, band, signal reports exchanged, to the VI88ACT Awards Manager, GPO Box 600, Canberra, A.C.T. 2601, Australia. NOTE: Claims must be certified as a true and correct record by at least one licensed amateur other than the applicant. (This requirement may be waived for applicants in remote areas—send an explanation if you wish to claim a waiver.)

yond the control of the WIAQ EXPO88 Committee, and absolutely ruinous to their plans. And until now we could cover the disaster only with that tiny LATE NEWS box in the June issue. Here now is the official information on the WIA Bicentenary observances. It comes over the signature of Daniel R. Steiner VK1ST, Chairman, Bicentenary Sub-Committee.—Ed.]

All Australian amateurs may use the AX prefix to replace the VK; and the Department of Transport and Communications has provided one VI88 prefixed callsign for each state and territory (see box). The Australian Capital Territory station, VI88ACT, has been active to date as follows:

State/ Territory	Callsign VI88
New South Wales	NSW
Victoria	VIC
Austr. Capital Terr.	ACT
Tasmania	TAS
South Austr.	SA
West Austr.	WA
Northern Terr.	NT
Queensland	QLD
Polonia RC (Victoria)	ABC
World Expo (Brisbane)	XPO

- Australia Day, January 26—many contacts made
- Canberra Day—during the March 19/20 Annual John Moyle Field Day Contest
- On the May 9th occasion of the opening of the new Australian Parliament House. (As of this writing, Queen Elizabeth II, the Queen of Australia, is to open the House, and VI88ACT will operate from 2200 UTC, May 8, through 1000 UTC, May 9, on 80 through 10, using frequencies ending in 88—3.588 MHz, 7.088, 14.188, 14.288, 21.288, etc.)

All VK1 amateurs will be encouraged to operate the VI88ACT call at least once during 1988.

VK1ST notes particularly that a special QSL card and an Australian Bicentenary National Capital Certificate will be offered. They are a matched pair. Each VI88ACT contact will qualify for a QSL. See box for Certificate details.

GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill
Camberley GU17 9JQ
England

The UK Scene

Good news for us! The license fee for UK amateur radio operation will remain at 12 pounds (about $20) for the next 12 months. Our regulatory body, the Department of Trade and Industry, recently announced a revision of the 47 different types of UK radio licenses (*yes, I said 47!*), and 25 of them got increases, as is normal for "revisions," but for once the amateur community was not affected.

The DTI has also released GB75 prefixes for club stations wishing to run demonstrations during this 75th anniversary year. The main purpose of the calls will be to demonstrate amateur radio to the general public, so operation by both Class A (HF) and B (VHF only) stations so-licensed must be such that the public has full access. They will be in conjunction, therefore, with town shows, festivals, village fairs, and the like. And not of the "five nine–go" contest style, one hopes. Amateur radio is difficult enough to explain to the man-in-the-street without the jargon.

The RSGB (Radio Society of Great Britain) is planning a series of 75th Anniversary events, which was to be published in the April issue of *RadCom*. Some events will be fully subscribed by the time you read this, but I am sure the RSGB can make a special effort to accommodate overseas visitors. Contact them directly for full information.

One such event, of special interest to RTTY enthusiasts, is an inaugural Data Symposium on the 22nd and 23rd of this month (July) at the Harrow School (which by itself is a treat for tourists), a few miles NW of Central London. RTTY may be thought of as old hat, but it really is the original form of data transmission. If it had been invented in the 80s, it would have be hailed as a major breakthrough.

Reminder: The British Amateur Radio Teleprinter Group (BARTG) transmits news bulletins on the first and third Sundays of each month on 3590 kHz and 14.090 MHz. Get details from and send contributions to: Bob Andrews G1JZJ, BARTG Manager, 5 Queens Road, Erdington, Birmingham B23 7JP, England.

NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

2300 MHz E-M-E World Record. During last October's ARRL International Moonbounce Contest a new world record was established between W3IWI (National Radio Astronomy Observatory, Greenbank, West Virginia) and ZL2AQE (Wellington), on October 18.

In John Shortland ZL2AQE's words, after disappointing beginnings and several phone calls to Greenbank, he found his 150-watt final was not radiating. Other ZLs had given up by now, but he decided W3IWI "was not going to get off the hook so easily." He patched out the final high power stages and ran the driver into the transmit feeder, giving an approximate power output of 6W at the dish feed. He made another quick call to Greenbank—and back at the transmitting position he heard W3IWI (Jay K5JL, operating) come in with an excellent signal strength as before. John answered and exchanged reports and confirmations, and then the stations broke the normal sequencing and exchanged greetings and congratulations: They had completed a world record distance for a two-way 2304-MHz contact. (See box for equipment data.) It was fitting that John and Jay were the operators. Jay has been helping ZLs in EME for some time, and John has been experimenting for some time with power production levels of over 100W at 2304 MHz. He has developed two

EQUIPMENT DATA

	W3IWI	ZL2AQE
Antenna	140'	12'
Tx Power	100W	6W
Rx noise	1dB	1dB
Beam width 3dB	.24°	1.5°
Track method	Auto	Manual
Polarization	-EME circular-	

high-power 2304 amplifiers. No doubt this year will see them, Ted ZL2TAX, Steve ZL2AZQ, and many others in the moonbounce contest. Keep an ear open for us!

A 50th Anniversary. On January 4, 1938, the Electrical and Wireless School opened to train the first Signals personnel in the then-new Royal New Zealand Air Force. The recent 50th anniversary celebration was like a mini hamfest, with more than half the 300 ex-students present being licensed amateurs.

With WW II breaking out in 1939, the school expanded rapidly, and by 1945, 5290 airmen and -women had been trained for eleven different jobs including wireless operators, telegraphists, DF operators, teleprinter operators, and radar operators. The postwar amateur radio boom was mainly due to the introduction to radio communications of such a large number of men and women in the Army, Navy, and Air Force.

Fraternal Twin Clubs? Is there another Hastings Amateur Radio Club anywhere in the world? If so, The Hastings ARC of New Zealand would like to make contact with you and exchange information and greetings some time in August and/or September, possibly on 20 meters, perhaps as the first of many goodwill exchanges. Research shows towns of that name in the U.S., Canada, England, and Australia. [*In the U.S., in Florida, Illinois, Michigan, Minnesota, Nebraska, New York (and a Hastings-On-Hudson also in NY), and Pennsylvania; there is a Hastings on the West Indies island of Barbados also.—Ed.*] If there is a radio club in one of these Hastings please quickly write airmail to the secretary of our Hastings ARC: Hugh Thornton ZL2TKL, 404 Hart Drive, Hastings, New Zealand so that we can set up a sked.

PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S.Joao do Estoril
2765 Portugal

Photo B. REP Chairman Carlos Nunes CT1CDL receives a plaque from IARU Secretary John Allawy G3FKM and Olga, his secretary. (Photo by Joao Lagoa CT1CFH)

January 28 was historic for REP. Celebrating its 60th anniversary, a ham convention was held in Caldas da Rainha, 55 miles north of Lisbon, one of a number of charming towns and villages in the beautiful hilly region famous for pottery making. Local mayors, tourist departments, and hams like Felizardo CT1ALF, and such guests as IARU Region 1's secretary, Mr. John Allawy, and Mr. Gonzalo Pomares, chairman, URE-Union de Radioaficionados Espalholes made it a success.

During the four days (at the Hotel Malhoa) sessions reached agreements on many subjects. Hams should promote amateur activity among the general public; should hold seminars to create new hams; should participate in international ham events to exchange ideas and keep up with new technologies, and working groups should study these technologies.

It was confirmed that Portugal would be the location for the 1990 IARU meeting; Portugal's radio pioneers were remembered and honored, and a visit was made to Portugal's Earth/Satellite station at the Companhia Portuguesa Radio Marconi site.

We had Jurgen Matthes DF6OM and YL as visitors from West Germany recently. He is a member of the International Air Traffic Controllers Net (IATCN)—tune daily on 14.277 kHz at 1130 GMT to hear more about it.

Among foreign hams living in Portugal I've found another friend, Gary Holt N7GHD—living right across the street! He likes CW, phone, and SSTV, and is available to climb crank-up towers when we need him!

Best 73 to all, 88 to the ladies.

THAILAND

Tony Waltham HS1AMH
International Liaison Officer
Radio Amateur Society of Thailand
PO Box 2008, Bangkok
Thailand

Within a few months we expect operations by licensed operators to resume in Thailand. Under new regulations, operations at first will be only from club stations.

At the end of 1982, the Society (RAST) advised its members transmitting HF to go QRT while the Post and Telegraph and security agencies reviewed the question of amateur radio with regards to fully legalizing the activity—as has now been done. In order to maintain Thailand's presence on the HF bands, RAST members turned to major international contests, which enabled a maximum number of QSOs to be sustained in short bursts of activity, in each case seeking and winning operating permission from the authorities.

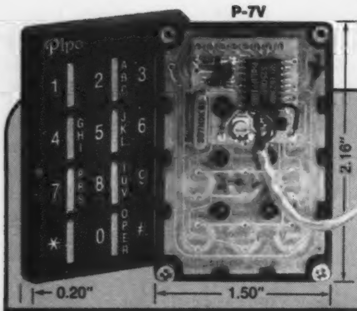
The new regulations, effective this year, include:

- Only Thai nationals, 15 or older will be eligible
- Qualified foreign residents will be able to apply, but only under reciprocal operating privilege agreements (I believe the US, Spain, and Chile have already lodged requests with the Thai Ministry of Foreign Affairs—the agency that handles this matter)
- A National Security Council or Police clearance will be required, as will membership in RAST
- Three classes of licenses are allowed: Novice, offering VHF only on 2 meters; a Secondary HF class with Morse code requirement and better technical knowledge; and a First Class license with Morse code requirement and more technical know-how.

The Thai P & T Department is very keen on reciprocal licensing, so RAST will be grateful for any help which can be given to encourage the appropriate national administrations to communicate with the Ministry of Foreign Affairs accordingly.

Thailand will host the SEANET convention this year, November 11–13. Please spread the word for us, since we have no HF operations yet! SEANET meets at 14.320 MHz at 1200 UTC. I will write program details when I know them.

RAST has a new committee we believe will be in an excellent position to do its best for the amateur radio service in Thailand. It is headed by the Permanent Secretary to the Communications Ministry, a long-term amateur radio enthusiast, Sribhumi Sukhanetr HS1SS, and includes several senior officials in the PTT in appointed or advisory positions. 1st and 2nd Vice Presidents are Thavorn Yaowakun and Mayuree Chotikul; Lt. Chamlong Chuathai is Secretary-general, Hans Hollstein is Assistant secretary; Treasurer is Rasdaporn Boonpitak, and in charge of public relations is Lt. Col. Prasit Neelayaothin.



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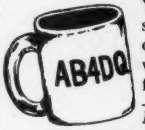

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Number 38 on your Feedback card

QTH DX

QTH is Cambodia

Leon Fletcher N6HYK
274 Webster Dr.
Ben Lomond CA 95005

For centuries, the country has been known as Cambodia. Many recent QSL cards still call it that. Both the United Nations and *The World Almanac* continue to call it Cambodia. But now the land is called Kampuchea. Cambodia is a country with even its name in conflict.

By whatever name, Cambodia is one of the most desirable countries to the typical DXer in the world. Consider these two points:

- Cambodia is the 18th most needed country, according to the latest study of "Most Wanted Survey" conducted by *The DX Bulletin* in July 1987.

- Exactly half of the nearly 1,000 DXers who reported their "wanted countries" to that study need Cambodia.

The typical Cambodian (and anyone else familiar with the country), however, who takes a look at the nation focuses on much different issues. The country suffers from widespread malnutrition, prevalent infectious diseases, especially malaria, inadequate roads, inconsequential manufacturing and other industries of negligible importance.

These are the words from no less an authority than the *Encyclopedia Britannica*.

Other observers, from field reporters to academic authors, point to equally depressing deficiencies. Even in the country's capital, Pnom Penh, most residents continue to haul water in buckets from communal taps. Piles of garbage line the streets. Key government and business buildings damaged more than ten years ago are still roofless. During the last few years, vandalism and looting have ruined classic temples dating from the eighth century.

Cambodians are exceedingly poor; the average citizen earns about $100 per year. And the prospects for improvement are not good. The number of agricultural technicians dropped from an already meager 1,400 to only 200 in the last decade. Only ten of these technicians have had graduate training. In a country of 6.3 million people, there are only 700 autos and 7,000 telephones.

The country's only daily newspaper is published by the army. Even so, more than half the people can't read or write anyway.

ZONE 26
CAMBODIA
XU1SS
1st Om QRV

A village QSL from one of the Cambodian "back-pack" hams.

Further, Cambodia rates amongst the highest in deaths from political voilence in the world. *The 1988 World Almanac* details 177 nations. It lists Cambodia as the only country whose government has "no single authority (that) controls the whole country." The country, however, continues to be represented in the United Nations by a government thrown out of office, and out of country, nine years ago.

Through all that, and more, hamming still goes on.

Why?

In such impoverished, inadequate, inferior conditions, why would people bother to take the time, and the risks, to ham?

"Cambodia is a country with even its name in conflict."

According to talk on the bands, Cambodian hams are trying to stay on the air to be ready for either of two possible futures of their nation. In case a "final" government encourages an open society, Cambodians will need hams for worldwide communications, especially in the reconstruction period. If a "final" restrictive government takes over and shuts off Cambodia from the rest of the world, the country's hams must stay ready for surreptitious operation to keep the world informed of their nation's developments. The latter case is how hamming in Cambodia works today.

Although the country is about the size of Missouri and has roughly the population of New Jersey, there are only six hams listed in this year's *Callbook*. They're identified by call signs only. No names are listed. No Cambodian addresses are given. There are reportedly only three sets of ham gear in the country. Japanese DXpeditions apparently left two of these set there years ago.

The occasional signals sent from Cambodia are reportedly from hams who must move their stations from village to village every few days, leading an observer to term it "Backpack hamming."

The hams, along with most residents, are constantly on the lookout against various hostile forces. There are resistance fighters backed by the United States, China, and non-Communist Asian countries. The Soviet Union supports opponent resistance fighters. Enemy troops cross the border from neighboring Vietnam. Add to all this attacks from common thugs and thieves.

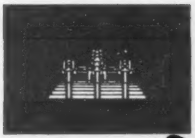
French missionary Francois Ponchaud in his book *Cambodia: Year Zero* describes the problems with which hams and locals have to cope. He quotes a Cambodian's explanation of how to get past the gangs of soldiers who set up roadblocks:

"To get from one place to another we had to have a mission order or a *laissez-passer* (a permit to pass). A lot of the Khmer Rouge (soldiers) didn't know how to read and those who could write did so very badly, so we wrote our own *laissez-passers*, trying to make them as illegible as possible. At Prek Kdam I showed mine to a Khmer Rouge who was on guard there. He looked at it upside down, glared at me, and said, 'All right, go on!'"

Today, few outsiders visit the country. Those who do often encounter grisly sights such as the infamous "pits of death"—giant mass graves. They are estimated to hold the remains of one to three million people. Award-winning British writer William Shawcross, in one of his books on Cambodia, *The Quality of Mercy*, tells about visiting one of the several mass graves located just a short distance from the center of Cambodia's capital city:

"Several hundred skulls had been neatly piled together. Femurs and limbs were in separate piles. Many of the wrists were still bound together with cord or wire, as they had been when the people were forced to kneel on the edge of the pits while Khmer Rouge soldiers clubbed them in the back of the neck. . . Flesh still clung to the hip joints and its terrible sweet-sour smell hung over the fields, so thick as to be almost a pall."

Cambodia is certainly a choice DX contact. It is also a very good thing, though, that amateur radio can help make the rest of the world more aware of the conditions inside this beleaguered nation. ■



C A M B O D I A
Phnom Penh

Number 39 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

JULY PROPAGATION FORECAST

July is likely to furnish a mixed bag of propagation for DXers.

The first and last weeks of the month are likely to be quite good, while the middle two weeks will exhibit only fair to poor conditions.

On the days when the Solar Flux index is over about 125 and the Planetary A index is below about 5, DX should be exceptionally good. The HF bands will stay open well after dark, but seasonal noise levels will create difficulty on 40 and 80 meters, due to thunderstorms and static.

Stay tuned into WWV (10 MHz is usually the best bet) for the solar and terrestrial conditions, report at 18 minutes after each hour.

On the days when the magnetic field is unsettled to active, east-west propagation paths will be difficult, but occasional good openings on north-south paths are likely. Signals will exhibit typical "arctic flutter"; hollow and ringing sounds.

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 F	2 F–G
3 G	4 G	5 G	6 G	7 G	8 G	9 G
10 G–F	11 F	12 F–G	13 G	14 F–P	15 P	16 F
17 F–P	18 P	19 P	20 P	21 P	22 P–F	23 F–G
24 G 31 G	25 G	26 G	27 G–F	28 F	29 G	30 G

F = Fair
G = Good
P = Poor

Note Trends

Short-range sporadic E openings on 10, 12, and 15 meter bands are very likely this month, with excellent signal strengths and abrupt changes.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	--	--	--	--	--	--	20	--	--	--	--	--
ARGENTINA	20	20	20	40D	40D	--	--	--	--	--	10	15
AUSTRALIA	--	--	--	20	20	40D	20D	20D	--	--	--	--
CANAL ZONE	15	20	20	--	--	--	20	20	20	--	10D	15
ENGLAND	20	--	40/80	40/80	--	--	--	--	--	20	20	20
HAWAII	15D	20	20	20	40D	40D	--	--	--	--	--	15D
INDIA	20D	20D	--	--	--	--	--	--	--	--	--	--
JAPAN	--	--	--	--	--	--	20	--	--	--	--	--
MEXICO	15	20	20	--	--	--	20	20	20	--	10D	15
PHILIPPINES	--	--	--	--	--	--	20D	--	--	--	--	--
PUERTO RICO	15	20	20	--	--	--	20	20	20	--	10D	15
SOUTH AFRICA	--	40	40	20D	20D	--	--	--	--	--	20D	20D
U. S. S. R.	20	20/40	20/40	--	--	--	--	--	--	--	20	20
WEST COAST	40	80	--	--	--	--	--	20	20	20	15	40

CENTRAL UNITED STATES TO:

ALASKA	--	--	20D	--	--	40D	--	20	--	--	--	--
ARGENTINA	20/40	20/40	20	40D	--	--	--	15	15	15	15/20	20
AUSTRALIA	15D	15D	15/20	20	20	40D	20	20	--	--	15D	15D
CANAL ZONE	20	20	20	40D	40D	--	20	20	15/20	15	10D	10D
ENGLAND	20	--	40D	40D	--	--	20D	20D	--	--	20	20
HAWAII	15	15	20	20	20	40D	20	20	--	--	--	15D
INDIA	20D	20D	--	--	--	--	20D	20D	--	--	--	--
JAPAN	--	--	20D	--	--	40D	--	20	--	--	--	--
MEXICO	20	20	20	40D	40D	--	20	20	15/20	15	10D	10D
PHILIPPINES	--	--	--	--	--	--	20D	20D	--	--	--	--
PUERTO RICO	20	20	20	--	--	--	20	20	15/20	15	10D	10D
SOUTH AFRICA	--	--	40D	20D	20D	--	--	--	--	--	--	--
U. S. S. R.	--	--	--	--	--	--	20D	20D	--	--	--	--

WESTERN UNITED STATES TO:

ALASKA	--	--	--	20	20	20D	40D	20D	20D	--	--	--
ARGENTINA	15	20D	20	20	--	--	--	20D	--	--	--	15
AUSTRALIA	15	15	15	20	20	20/40	40	20/40	--	--	--	--
CANAL ZONE	10D	15	20	20	40D	40D	--	20	20	--	15	10D
ENGLAND	20	20	20D	--	--	--	--	20D	--	--	--	20D
HAWAII	15	15	15/20	20	20	20/40	40/80	--	20	--	15D	15
INDIA	--	--	20D	20D	--	--	--	20D	20D	--	--	--
JAPAN	--	--	--	20	20	20D	40D	20D	20D	--	--	--
MEXICO	10D	15	20	20	40D	40D	--	20	20	--	15	10D
PHILIPPINES	--	--	--	20D	20D	--	--	20D	20D	--	--	--
PUERTO RICO	10D	15	20	20	40D	40D	--	20	20	--	15	10D
SOUTH AFRICA	--	--	--	20D	20D	--	--	--	--	--	--	--
U. S. S. R.	20D	20D	20D	--	--	--	--	20D	--	--	--	--
EAST COAST	40	80	--	--	--	--	--	20	20	20	15	40

The band openings are for June, July and August. Note that a (D) will indicate a difficult path. Try on days when the geomagnetic field is quiet (G) and when solar flux is 100 and greater.

More VHF Propagation Modes

Most communication at HF is via the F region of the ionosphere, its highest ionized layer. With increasing sunspot activity and higher ionization levels, the F2 layer will begin to support worldwide propagation on ten meters and above. In fact, earlier sunspot cycles have shown the F2 maximum usable frequency (MUF) can exceed 70-75 MHz! Six meter DX may reach an all-time high with the current solar cycle if predictions come true.

Even when the higher HF bands are relatively quiet, there is often favorable north-south propagation, say between the North and South America or between Europe and Africa. Increased solar activity will bring transequatorial (TE) propagation at MUFs even higher than supported by the F2 layer. TE usually occurs within a 2500-3000 mile region north and south of the equator. Under optimum conditions TE will provide openings at least as high as 450 MHz!

May, June, and July are popular VHF DX months in the northern hemisphere due to the Sporadic E (E_S). Relatively localized patches of ionization occur within the E region, which lies below the F region. E_S is most common within the equatorial latitudes, but late spring and early summer show increased activity at higher latitudes. At 15 and 10 meters, single hop E_S will cover approximately 1300 miles. Of course, multiple hops can increase this distance to several thousand miles. Sporadic E is very good for six meter propagation, and many VHFers have successfully made contact on 144 MHz. Apparently, E_S does not support propagation very well above two meters.

Residents outside of the equatorial latitudes know auroral propagation all too well. During these disturbances of the ionosphere and magnetosphere, weak, garbled HF signals provide a tip to auroral activity. Signal distortion, which makes a voice signal sound much like the sender is gargling, is caused by the rapid variations of ion density. The shimmering visual effect of aurora is similar to what happens with radio waves. Because of the distortion, CW may be the only reliable mode for communications via aurora. Aurora are rare below 35° latitude. They will, however, support propagation over 1200 miles at frequencies greater than 450 MHz.

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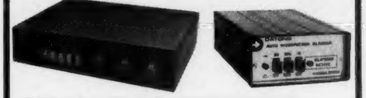

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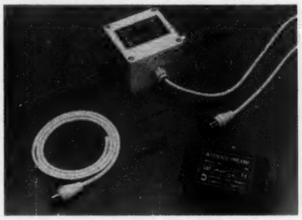

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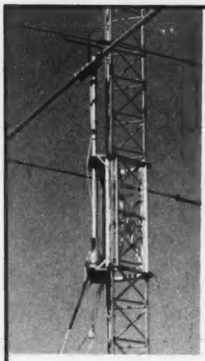

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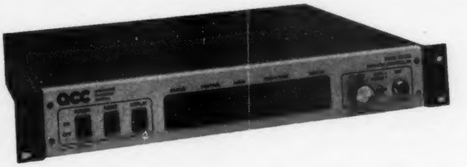

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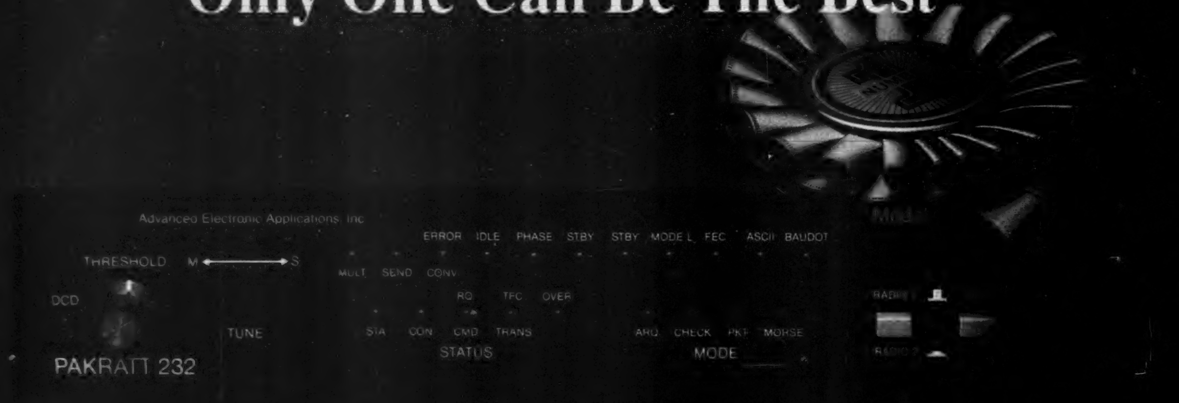

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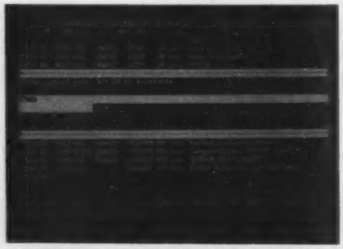

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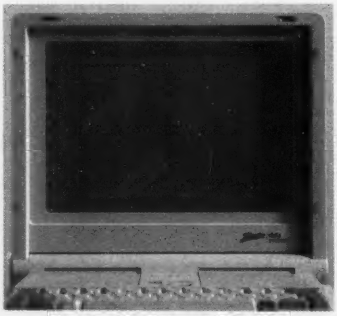

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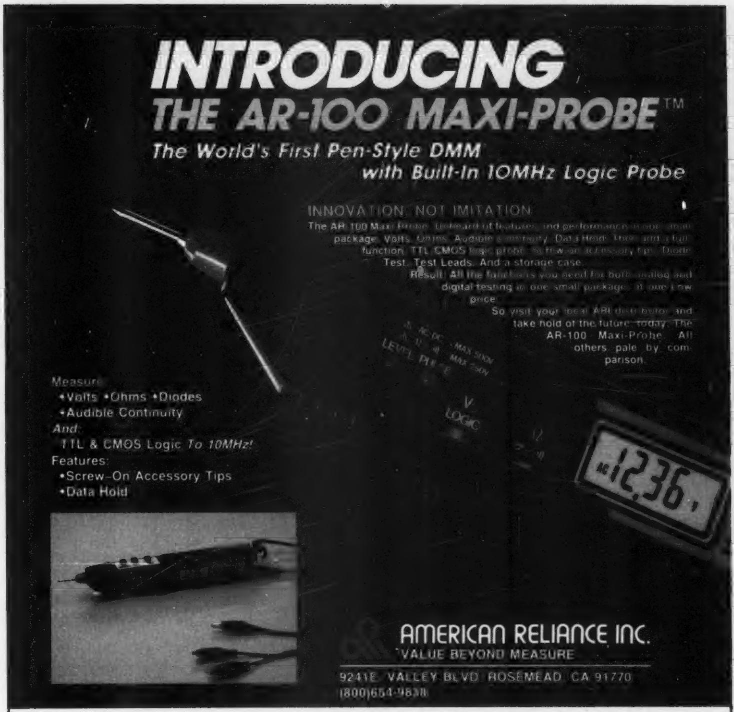

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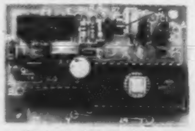

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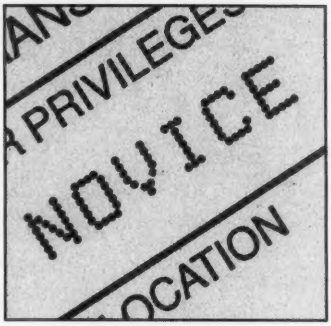

Finally. The 220-MHz, 1.2-GHz, and 10-meter phone bands are open to Novice operation.

And to work these bands, Yaesu's offering you a complete range of innovative HF, VHF, and UHF radios. Each with performance that Novices—and Extra Class operators, too—can really appreciate.

HT power perfected. There's a good reason you'll find the 220-MHz FT-109RH on more belts than any other. It simply out-classes the rest.

With a powerful five watts to get you out. A battery saver to keep you going. And a wealth of microprocessor-controlled features you'd expect only from a radio many times its size.

HT power in its smallest form. Finally, a miniature HT that you can really take seriously.

The FT-33R fits easily into your jacket pocket. But unlike the others, it features microprocessor control for quick, simple, and surprisingly intelligent operation.

And what other mini HT features five-watt output, a rugged aluminum-alloy case, and rain-resistant seals?

Two for the road. Our 220-MHz FT-311RM and 1.2-GHz FT-2311R are two of the most popular mobiles for two popular reasons.

One, they're built for performance. With slick microprocessor-controlled functions to get you around fast. And far.

And two, unlike most mobiles, they're built for simplicity. Because the last thing you need is a radio that interferes with your driving.

World-class operation. With our FT-757GX Mark II, you're ready to tackle the HF bands with all the full-featured performance an experienced operator demands.

Plus, when you upgrade to General Class, you won't have to upgrade your radio. Because with the FT-757GX Mark II, you've already started with the best. It's a great way to get maximum HF performance for your dollar.

Tune in to Yaesu. You've earned your ticket to the exciting world of amateur radio. Now, discover the exciting world of ham radio technology.

Yaesu's all the ticket you'll need.

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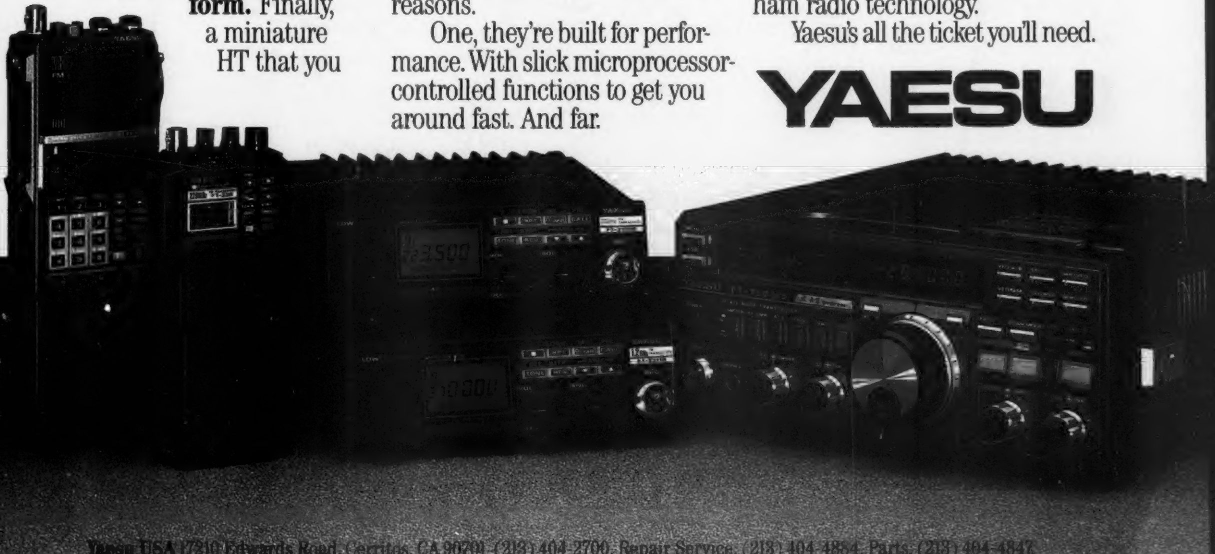

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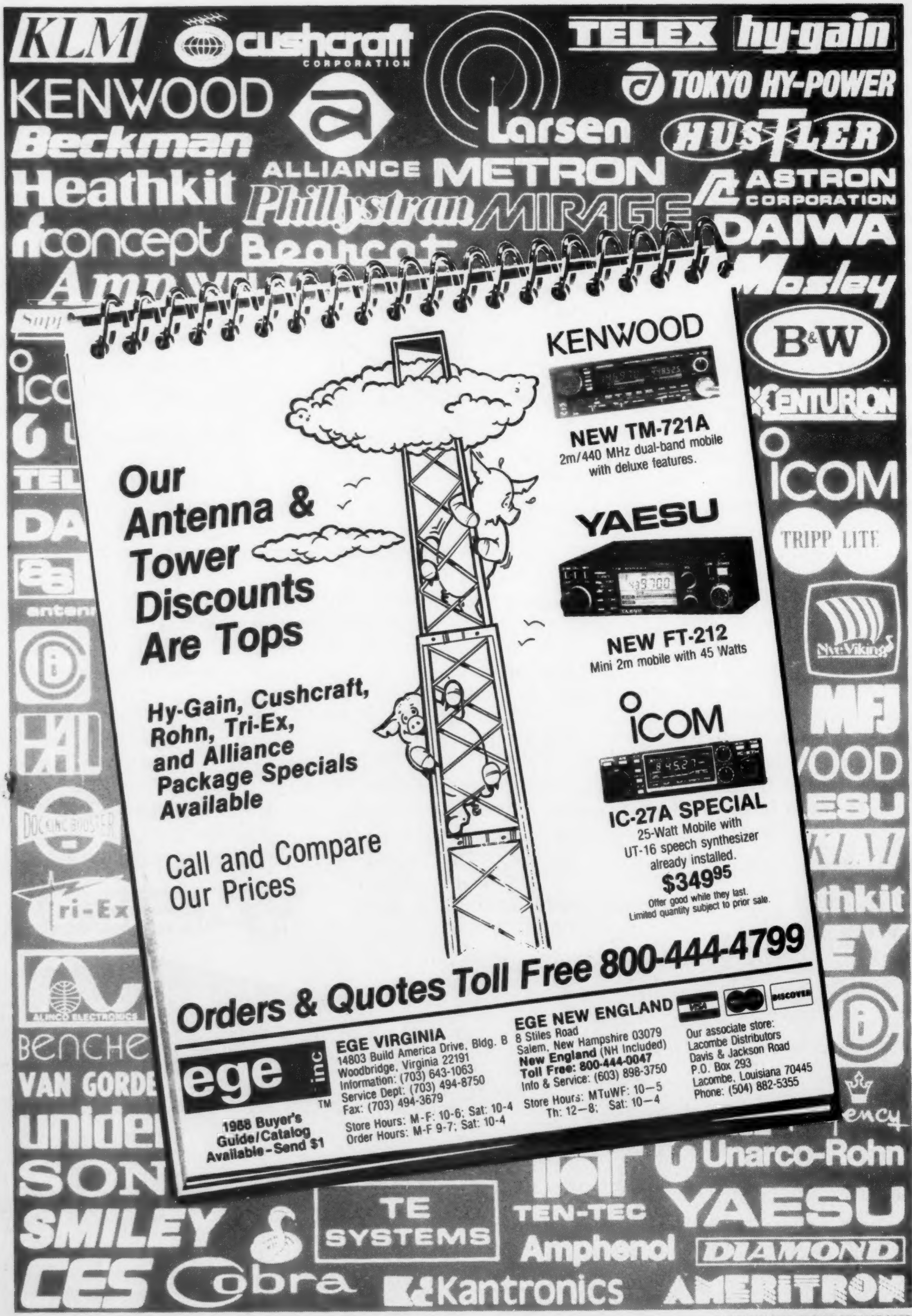
Prices and specifications subject to change without notice.

CIRCLE 111 ON READER SERVICE CARD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Phone: (504) 882-5355

CIRCLE 133 ON READER SERVICE CARD

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other guys are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100 kHz straight through to 30 MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board. I can't wait to tell my buddies I worked England on a repeater!

And with the money I saved when I bought my FT-747GX, I got a second ten-meter antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense."

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700. **Repair Service:** (213) 404-4884.
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YAESU

CIRCLE 165 ON READER SERVICE CARD

"They laughed when they saw my radio. Then they saw my logbook."

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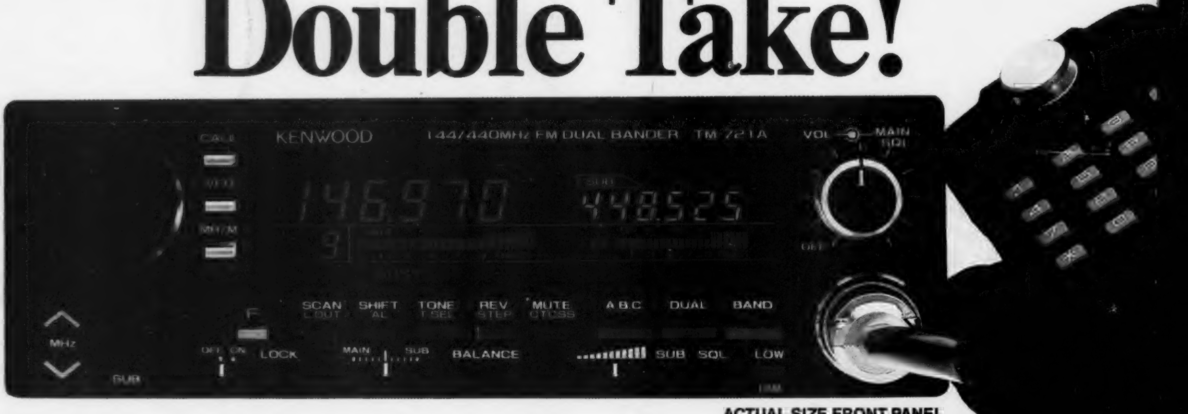
THE FIRST 144/220 MHz Dual Bander!

Double Take!



ACTUAL SIZE FRONT PANEL

TM-621A/721A

144/220 and 144/450 MHz FM Dual Banders

Once again, Kenwood brings you another Dual Bander First! The TM-621A is the first 144/220 MHz FM Dual Bander. The Kenwood TM-621A and TM-721A (144/450 MHz) re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more!

- **Extended receiver range** (138.000-173.995 MHz) on 2 m; 70 cm coverage is 438.000-449.995 MHz; 1-1/4 m coverage is 215-229.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **Separate frequency display for "main" and "sub-band."**
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **45 Watts on 2 m, 35 watts on 70 cm. 25 watts on 1-1/4 m.** Approx. 5 watts low power.
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Balance control and separate squelch controls for each band.**
- **Dual antenna ports.**
- **TM-621A has auto offset.**
- **Full duplex operation.**
- **CTCSS encode/decode selectable from front panel** or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

146.970
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RC-10

TM-721A shown with optional RC-10.

Optional Accessories:
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2 m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-4000** Dual band 2 m/70 cm mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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